IEEE Xplore®
RELEASE 1.8

Welcome
United States Patent and Trademark Office

Your search matched **0** of **1085387** documents.
A maximum of **500** results are displayed, **15** to a page, sorted by **Relevance Descending** order.

Refine This Search:
You may refine your search by editing the current search expression or enteri new one in the text box.

conductive <phrase> medium <and> rhythmic [Search]

☐ Check to search within this result set

Results Key:
JNL = Journal or Magazine **CNF** = Conference **STD** = Standard

Results:
No documents matched your query.

Refine Search

Search Results -

Terms	Documents
L6 and rhythmic	10

Database:

US Pre-Grant Publication Full-Text Database
US Patents Full-Text Database
US OCR Full-Text Database
EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Search: L7

Refine Search

Recall Text Clear Interrupt

Search History

DATE: Wednesday, October 27, 2004 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=NO; OP=OR		
L7	L6 and rhythmic	10	L7
L6	conduct$5 adj medium	9150	L6
L5	conduct$5 and rhythmic adj input	4	L5
L4	conduct$5 same medium and rhythmic adj input	0	L4
L3	conduct$5 near medium and rhythmic adj input	0	L3
L2	conduct$5 near medium and rhthmic adj input	0	L2
L1	5,446,828.pn.	2	L1

END OF SEARCH HISTORY

Hit List

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Search Results - Record(s) 1 through 10 of 10 returned.

☐ 1. Document ID: US 20030026436 A1

Using default format because multiple data bases are involved.

L7: Entry 1 of 10 File: PGPB Feb 6, 2003

PGPUB-DOCUMENT-NUMBER: 20030026436
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030026436 A1

TITLE: Apparatus for acoustically improving an environment

PUBLICATION-DATE: February 6, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Raptopoulos, Andreas	London	PA	GB	
Klien, Volkmar	Wien		AT	
Robson, Dominic	London		GB	
Scourboutis, Eugene	London		GB	
Welter, Jeremy Hugh	Pittsburgh		US	

US-CL-CURRENT: 381/71.4

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

☐ 2. Document ID: US 4741342 A

L7: Entry 2 of 10 File: USPT May 3, 1988

US-PAT-NO: 4741342
DOCUMENT-IDENTIFIER: US 4741342 A

TITLE: Cardiac pacemaker with selective unipolar/bipolar pacing

DATE-ISSUED: May 3, 1988

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Stotts; Lawrence J.	Lake Jackson	TX		

US-CL-CURRENT: 607/30; 607/12

☐ 3. Document ID: US 4075215 A

L7: Entry 3 of 10 File: USPT Feb 21, 1978

US-PAT-NO: 4075215
DOCUMENT-IDENTIFIER: US 4075215 A

TITLE: Thieno-pyridine derivatives

DATE-ISSUED: February 21, 1978

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Castaigne; Albert Rene Joseph	Toulouse			FR

US-CL-CURRENT: 546/114; 514/821, 546/115

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De |

☐ 4. Document ID: US 4016769 A

L7: Entry 4 of 10 File: USPT Apr 12, 1977

US-PAT-NO: 4016769
DOCUMENT-IDENTIFIER: US 4016769 A

TITLE: Indexing drive for transfer lines

DATE-ISSUED: April 12, 1977

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Froschle; Gerhard	Kongen			DT

US-CL-CURRENT: 74/37

| Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De |

☐ 5. Document ID: US 3640344 A

L7: Entry 5 of 10 File: USPT Feb 8, 1972

US-PAT-NO: 3640344
DOCUMENT-IDENTIFIER: US 3640344 A

TITLE: FRACTURING AND SCAVENGING FORMATIONS WITH FLUIDS CONTAINING LIQUEFIABLE GASES AND ACIDIZING AGENTS

DATE-ISSUED: February 8, 1972

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Brandon; Clarence W.	Tulsa	OK		

US-CL-CURRENT: 166/249; 166/307, 166/308.1, 175/61, 175/67

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

---

☐ 6. Document ID: WO 200029970 A1

L7: Entry 6 of 10 File: DWPI May 25, 2000

DERWENT-ACC-NO: 2000-387909
DERWENT-WEEK: 200033
COPYRIGHT 2004 DERWENT INFORMATION LTD
TITLE: Oscillatory neuro-computer for simulating oscillatory nature of brain neurons, has conductive medium coupled to connectors, which applies oscillatory signal to each oscillator via corresponding connector

INVENTOR: HOPPENSTEADT, F C; IZHIKEVICH, E

PRIORITY-DATA: 1998US-108353P (November 13, 1998)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
WO 200029970 A1	May 25, 2000	E	038	G06F015/18

INT-CL (IPC): G06 F 15/18; G06 F 15/80

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

---

☐ 7. Document ID: US 3339635 A

L7: Entry 7 of 10 File: USOC Sep 5, 1967

US-PAT-NO: 3339635
DOCUMENT-IDENTIFIER: US 3339635 A

TITLE: Method and apparatus for forming and/or augmenting an energy wave

DATE-ISSUED: September 5, 1967

INVENTOR-NAME: BRANDON CLARENCE W

US-CL-CURRENT: 166/249; 165/62, 166/177.1, 166/59, 166/60, 62/467

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

---

☐ 8. Document ID: US 3302720 A

L7: Entry 8 of 10 File: USOC Feb 7, 1967

US-PAT-NO: 3302720
DOCUMENT-IDENTIFIER: US 3302720 A

TITLE: Energy wave fractureing of formations

DATE-ISSUED: February 7, 1967

INVENTOR-NAME: BRANDON CLARENCE W

US-CL-CURRENT: 166/249; 166/177.1, 175/56

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

---

☐ 9. Document ID: US 3133591 A

L7: Entry 9 of 10 File: USOC May 19, 1964

US-PAT-NO: 3133591
DOCUMENT-IDENTIFIER: US 3133591 A

TITLE: Method and apparatus for forming and/or augmenting an energy wave

DATE-ISSUED: May 19, 1964

INVENTOR-NAME: BRANDON CLARENCE W

US-CL-CURRENT: 166/249; 116/DIG.22, 166/177.1, 166/60

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

---

☐ 10. Document ID: US 3015979 A

L7: Entry 10 of 10 File: USOC Jan 9, 1962

US-PAT-NO: 3015979
DOCUMENT-IDENTIFIER: US 3015979 A

TITLE: Electronic musical instrument

DATE-ISSUED: January 9, 1962

INVENTOR-NAME: MERLIN DAVIS

US-CL-CURRENT: 84/639; 984/304, 984/DIG.1

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Terms	Documents
L6 and rhythmic	10

Display Format: - Change Format

Previous Page Next Page Go to Doc#

Refine Search

Search Results -

Terms	Documents
L8 and conduct$4	4

Database:
US Pre-Grant Publication Full-Text Database
US Patents Full-Text Database
US OCR Full-Text Database
EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Search: L9

Refine Search

Recall Text Clear Interrupt

Search History

DATE: Wednesday, October 27, 2004 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; PLUR=NO; OP=OR		
L9	L8 and conduct$4	4	L9
L8	rhythmic adj input	11	L8
L7	L6 and rhythmic	10	L7
L6	conduct$5 adj medium	9150	L6
L5	conduct$5 and rhythmic adj input	4	L5
L4	conduct$5 same medium and rhythmic adj input	0	L4
L3	conduct$5 near medium and rhythmic adj input	0	L3
L2	conduct$5 near medium and rhthmic adj input	0	L2
L1	5,446,828.pn.	2	L1

END OF SEARCH HISTORY

Hit List

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Search Results - Record(s) 1 through 4 of 4 returned.

☐ 1. Document ID: US 20020004191 A1

Using default format because multiple data bases are involved.

L9: Entry 1 of 4 File: PGPB Jan 10, 2002

PGPUB-DOCUMENT-NUMBER: 20020004191
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020004191 A1

TITLE: Method and system for teaching music

PUBLICATION-DATE: January 10, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Tice, Deanna	Vancouver		CA	
Douglas, Susan	Fredericton		CA	
Parsons, Andrew	Fredericton		CA	
McClune, Stuart	Fredericton		CA	
Lussier, Alain	Oromocto		CA	
Perkins, Ian Jonathan	Fredericton		CA	
Nachtigall, Timothy	Fredericton		CA	
Munro, Michael	New Maryland		CA	
Sawler, Trevor	Douglas		CA	
Savoy, Michael	Grand Bay-Westfield		CA	

US-CL-CURRENT: 434/350

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

☐ 2. Document ID: US 6751439 B2

L9: Entry 2 of 4 File: USPT Jun 15, 2004

US-PAT-NO: 6751439
DOCUMENT-IDENTIFIER: US 6751439 B2

TITLE: Method and system for teaching music

DATE-ISSUED: June 15, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Tice; Deanna L.	Vancouver			CA
Douglas; Susan L.	Fredericton			CA
Parsons; Andrew L.	Fredericton			CA
McClune; Stuart D.	Fredericton			CA
Lussier; Alain J. P.	Oromocto			CA
Perkins; Ian Jonathan	Fredericton			CA
Nachtigall; Timothy M.	Fredericton			CA
Munro; Michael L.	New Maryland			CA
Sawler; Trevor C.	Douglas			CA
Savoy; Michael J.	Grand Bay-Westfield			CA

US-CL-CURRENT: 434/350; 434/307R, 434/365, 84/477R

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

---

☐ 3. Document ID: US 5146833 A

L9: Entry 3 of 4 File: USPT Sep 15, 1992

US-PAT-NO: 5146833
DOCUMENT-IDENTIFIER: US 5146833 A

TITLE: Computerized music data system and input/out devices using related rhythm coding

DATE-ISSUED: September 15, 1992

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Lui; Philip Y. F.	New York	NY	10011	

US-CL-CURRENT: 84/462; 84/477R, 84/484, 84/611, 84/DIG.12

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

---

☐ 4. Document ID: US 3292764 A

L9: Entry 4 of 4 File: USOC Dec 20, 1966

US-PAT-NO: 3292764
DOCUMENT-IDENTIFIER: US 3292764 A

TITLE: Typesetting systems

DATE-ISSUED: December 20, 1966

INVENTOR-NAME: MIDGETTE ERNST L; O'BRIEN RICHARD C ; NEIL SCHLEIFMAN

US-CL-CURRENT: 199/18, 199/25, 400/50, 400/73

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Terms	Documents
L8 and conduct$4	4

Display Format: - Change Format

Previous Page Next Page Go to Doc#

Your search matched **0** of **1085387** documents.
A maximum of **500** results are displayed, **15** to a page, sorted by **Relevance Descending** order.

Refine This Search:
You may refine your search by editing the current search expression or enteri new one in the text box.

rhythmic <phrase> input [Search]

☐ Check to search within this result set

Results Key:
JNL = Journal or Magazine **CNF** = Conference **STD** = Standard

Results:
No documents matched your query.

```
Set     Items   Description
S1        256   NEURO()COMPUTER? OR NEUROCOMPUTER?
S2     348463   OSCILLAT?
S3     471215   RHYTHMIC? OR METRICAL OR MEASURED OR CADENCED
S4    5387150   FREQUENCY OR FREQUENCIES OR SIGNAL? OR WAVE? ? OR PULSE? ?
             OR WAVEFORM? ? OR TIME OR PERIODICALLY OR INTERVAL? OR DURATI-
             ON
S5    1716819   DIFFERENCE? ? OR VARIANCE? ? OR VARIATION OR DIVERGENCE OR
             DEVIATION OR DIFFERENT
S6          1   S1 AND S2 AND S3
S7          3   S1 AND S2
S8         14   S1 AND S3
S9        155   S1 AND S4
S10        41   S9 AND S5
S11        52   S7 OR S8 OR S10
S12        24   S11 AND IC=(G06E? OR G06F? OR G06G?)
S13         2   S11 AND MC=(T01-J16 OR T01-M02 OR T02-A04A5 OR U23-H)
S14        24   S12 OR S13
File 347:JAPIO Nov 1976-2004/Jun(Updated 041004)
         (c) 2004 JPO & JAPIO
File 350:Derwent WPIX 1963-2004/UD,UM &UP=200467
         (c) 2004  Thomson Derwent
```

14/5/1 (Item 1 from file: 347)
DIALOG(R)File 347:JAPIO

06048601 **Image available**
CONTROLLER

PUB. NO.: 10-331701 [JP 10331701 A]
PUBLISHED: December 15, 1998 (19981215)
INVENTOR(s): FUJIEDA MAMORU
OSUGA MINORU
NOGI TOSHIJI
OYAMA TAKASHIGE
APPLICANT(s): HITACHI LTD [000510] (A Japanese Company or Corporation), JP (Japan)
APPL. NO.: 10-092941 [JP 9892941]
FILED: April 06, 1998 (19980406)
INTL CLASS: [6] F02D-041/34; B60K-041/28; F02D-041/00; G05B-011/32; G05B-013/02; G05B-015/02; G05B-021/02; **G06F-015/18** ; B60G-023/00
JAPIO CLASS: 21.2 (ENGINES & TURBINES, PRIME MOVERS -- Internal Combustion); 22.3 (MACHINERY -- Control & Regulation); 26.2 (TRANSPORTATION -- Motor Vehicles); 45.4 (INFORMATION PROCESSING -- Computer Applications)
JAPIO KEYWORD:R002 (LASERS); R038 (CHEMISTRY -- Exhaust Gas Desulfurization); R097 (ELECTRONIC MATERIALS -- Metal Oxide Semiconductors, MOS); R098 (ELECTRONIC MATERIALS -- Charge Transfer Elements, CCD & BBD); R131 (INFORMATION PROCESSING -- Microcomputers & Microprocessers)

ABSTRACT
PROBLEM TO BE SOLVED: To properly control an actuator by providing a **neuro - computer** to which an output of a second sensor **different** from a first sensor, and controlling the actuator based on an output of the **neuro - computer** .

SOLUTION: A **signal** of a knocking sensor 8 is input to a sample hold circuit 11 via an amplifier 9. The input **signal** 10 is a **time** series **signal** . The sample hold circuit 11 sample holds the **signal** 10 at a constant **time** cycle, and it is input as a special multivariate **signal** , 12a, 12b, 12c,..., 12n in input order, to an input phase of a **neuro - computer** 13. According to a **signal** 15 from a control circuit 2 the circuit 11 is controlled. An output 14 of the **neuro - computer** 13 is output as a voltage proportional to the strength of knocking in an engine, and then it is converted into a digital **signal** by a D/A converter of the circuit 2 to control the ignition timing. Accordingly, a proper control is assured.

14/5/2 (Item 2 from file: 347)
DIALOG(R)File 347:JAPIO

06023644 **Image available**
CONTROLLER

PUB. NO.: 10-306744 [JP 10306744 A]
PUBLISHED: November 17, 1998 (19981117)
INVENTOR(s): FUJIEDA MAMORU
OSUGA MINORU
NOGI TOSHIJI
OYAMA TAKASHIGE
APPLICANT(s): HITACHI LTD [000510] (A Japanese Company or Corporation), JP (Japan)
APPL. NO.: 10-092942 [JP 9892942]
FILED: April 06, 1998 (19980406)
INTL CLASS: [6] F02D-045/00; B60G-017/015; B60K-041/28; F02D-041/34;

G05B-013/02; **G06F-015/18** ; **G06F-015/18**
JAPIO CLASS: 21.2 (ENGINES & TURBINES, PRIME MOVERS -- Internal Combustion); 22.3 (MACHINERY -- Control & Regulation); 26.2 (TRANSPORTATION -- Motor Vehicles); 45.4 (INFORMATION PROCESSING -- Computer Applications)
JAPIO KEYWORD:R002 (LASERS); R097 (ELECTRONIC MATERIALS -- Metal Oxide Semiconductors, MOS); R098 (ELECTRONIC MATERIALS -- Charge Transfer Elements, CCD & BBD); R131 (INFORMATION PROCESSING -- Microcomputers & Microprocessers)

ABSTRACT

PROBLEM TO BE SOLVED: To alternate the control patterns of a plurality of actuators together according to target value, by providing a **neurocomputer** having a plurality of input and output ports, and alternating the weighting of the **neurocomputer** or the like according to the **difference** between an output **signal** of a certain output port, and a set point of the same.

SOLUTION: A neurocomputor comprises the neuroelements 30a-30c on an input layer, and the singals from a sample hold circuit are successively input thereto through the input ports 12a-12c. The outputs of the neuroelements 30a-30c are respectively input to the neuroelements 31a-31c of an intermediate layer after the weighting factors are added thereto. The outputs of the neuroelements 31a-31c to which a threshold value .theta.(sub 1) is added, are input to the neuro element 32 of an output layer to which the weighting factors are respectively added, and are output with a threshold value .theta.(sub 2) of the neuroelement 32. On this occasion, whether the same is correctly output to the output layer or not, is determined, and in the case of YES, the weighting coefficient is increased, and the threshold value is reduced, to adjust the weighting factor and the threshold value corresponding to the **difference** from the correct answer.

14/5/3 (Item 3 from file: 347)
DIALOG(R)File 347:JAPIO

05862671 **Image available**
METHOD FOR MONITORING TRANSMISSION QUALITY FOR CATV SYSTEM AND ITS METHOD

PUB. NO.: 10-145771 [JP 10145771 A]
PUBLISHED: May 29, 1998 (19980529)
INVENTOR(s): OMURA HIDEYUKI
NAKAYAMA SHOICHI
APPLICANT(s): FURUKAWA ELECTRIC CO LTD THE [000529] (A Japanese Company or Corporation), JP (Japan)
APPL. NO.: 08-298807 [JP 96298807]
FILED: November 11, 1996 (19961111)
INTL CLASS: [6] H04N-007/16; **G06F-015/18** ; H04L-029/14; H04N-007/12
JAPIO CLASS: 44.6 (COMMUNICATION -- Television); 44.3 (COMMUNICATION -- Telegraphy); 45.4 (INFORMATION PROCESSING -- Computer Applications)
JAPIO KEYWORD:R012 (OPTICAL FIBERS); R131 (INFORMATION PROCESSING -- Microcomputers & Microprocessers)

ABSTRACT

PROBLEM TO BE SOLVED: To improve transmission efficiency, to shorten nonoperating time of a system and to improve the transmission quality of the incoming line of the system without performing an extensive modification work on the transmission line.

SOLUTION: In the two-way CATV (community antenna television system) system in which a center station 1 and plural local stations 2 are connected via a tree-form transmission line 4, a relation between noise characteristic amount and code error ratio in the incoming line of the two-way CATV system is **measured** before starting communication service and previously making a **neurocomputer** 18 learn this relation, and after the system operation is

started, making the **neurocomputer** 18 predict types of code errors using the noise characteristic amount observed in a flowing noise observation device 16, and an error correction or the change of control device is directed to the local stations based on this code errors.

14/5/8 (Item 8 from file: 347)
DIALOG(R)File 347:JAPIO

04675663 **Image available**
WEATHER FORECASTING SYSTEM AND **NEURO - COMPUTER** CONTROL SYSTEM

PUB. NO.: 06-347563 [JP 6347563 A]
PUBLISHED: December 22, 1994 (19941222)
INVENTOR(s): EMURA NORIO
MASUI HIRONARI
APPLICANT(s): HITACHI LTD [000510] (A Japanese Company or Corporation), JP (Japan)
APPL. NO.: 05-136267 [JP 93136267]
FILED: June 07, 1993 (19930607)
INTL CLASS: [5] G01W-001/10; G01W-001/02; **G06F-015/18**
JAPIO CLASS: 46.1 (INSTRUMENTATION -- Measurement); 45.4 (INFORMATION PROCESSING -- Computer Applications)
JAPIO KEYWORD:R131 (INFORMATION PROCESSING -- Microcomputers & Microprocessers)

ABSTRACT
PURPOSE: To estimate following weather information by making a **neuro - computer** learn change of past weather information, and then inputting previous weather information in a **time** series manner.

CONSTITUTION: Weather information Fin, Fout for inputting, outputting observing spots L are allocated to neurons Nin, Nout of an input layer 20, an output layer 22 of a **neuro - computer** . Weather actual measurement information data of the spots L **measured** at **different** times T are input to the layer 20, the following weather information of the spot L is estimated by using learning information, and output 22 as weather estimation information Hout. The Fin observed at the **time** is converted into weather actual measurement information Hin, and input to the layer 22 thereby to update the learning information. The Fin before a predetermined **time** and present **time** point sent from the spots L to an information processor is converted, input to the layer 22, following weather state is estimated by using the leaning information, output 22 as Hout, and converted into Fout. Thus, weather information of the spot L after a predetermined **time** is estimated.

14/5/9 (Item 9 from file: 347)
DIALOG(R)File 347:JAPIO

04495320 **Image available**
NEURO COMPUTER

PUB. NO.: 06-139220 [JP 6139220 A]
PUBLISHED: May 20, 1994 (19940520)
INVENTOR(s): MOGI KEIJI
SHIBATA KATSUNARI
SATO YUJI
ASAI MITSUO
SAKAGUCHI TAKAHIRO
HASHIMOTO MASA
OCHIAI TATSUO
OKABASHI TAKUO
TAKAYANAGI HIROSHI
KUWABARA YOSHIHIRO

APPLICANT(s): HITACHI LTD [000510] (A Japanese Company or Corporation), JP (Japan)
HITACHI MICOM SYST KK [000000] (A Japanese Company or Corporation), JP (Japan)
APPL. NO.: 04-292446 [JP 92292446]
FILED: October 30, 1992 (19921030)
INTL CLASS: [5] **G06F-015/18 ; G06G-007/60**
JAPIO CLASS: 45.4 (INFORMATION PROCESSING -- Computer Applications)
JOURNAL: Section: P, Section No. 1788, Vol. 18, No. 441, Pg. 146, August 17, 1994 (19940817)

ABSTRACT

PURPOSE: To decide convergence after learning at a high speed by outputting the convergence decision result of an output neuron to a general flag provided in the neuron at each **time** of learning and also outputting the OR coupling result of general flags of all output neurons to a control part.

CONSTITUTION: A register for a general flag 40 is placed in each neuron 30. An arithmetic operation element 33 when deciding convergence conditions calculates the **difference** between an output value and tutor data, and an allowable error and outputs state information on the arithmetic result to the general flag 40. **Signals** from general flags 40 from respective neurons are put together in one and sent to an OR element 42 in the control part 10. The OR element 42 stores the result of OR arithmetic operation with the output **signal** of a summarizing register 43. An instruction control part 13 executes a branch instruction based upon the contents of the summarizing register 43 when all learning patterns are learnt to decide the convergence.

14/5/10 (Item 10 from file: 347)
DIALOG(R)File 347:JAPIO

04342577 **Image available**
MULTIPLE REGRESSION MODEL GENERATING PROCESSING METHOD

PUB. NO.: 05-334277 [JP 5334277 A]
PUBLISHED: December 17, 1993 (19931217)
INVENTOR(s): TSUZUKI HIROYUKI
APPLICANT(s): FUJITSU LTD [000522] (A Japanese Company or Corporation), JP (Japan)
APPL. NO.: 04-142269 [JP 92142269]
FILED: June 03, 1992 (19920603)
INTL CLASS: [5] **G06F-015/18 ; G06F-015/36 ; G06G-007/60**
JAPIO CLASS: 45.4 (INFORMATION PROCESSING -- Computer Applications)
JOURNAL: Section: P, Section No. 1714, Vol. 18, No. 169, Pg. 137, March 22, 1994 (19940322)

ABSTRACT

PURPOSE: To generate a high precise multiple regression model by a method for generating the multiple regression model of an object by specifying the multiple regression constant matrix of the multiple regression model formed between input data indicated by plural input components inputted to the object and output data indicated by a single output component outputted from the object.

CONSTITUTION: A **neurocomputer** 1 constituted of a single input unit for receiving fixed data, the input unit for receiving the input data indicated by the input components and a single output unit for calculating and outputting the value of the sum of the products of the data received by the input unit and a weight value is prepared. At first, when the **measured** input data are inputted to the **neurocomputer** 1, the weight values are learned so that the **measured** output data are outputted from the **neurocomputer** 1. Then, the learned weight data are specified as the multiple regression constant matrix and the multiple regression model is

generated.

14/5/11 (Item 11 from file: 347)
DIALOG(R)File 347:JAPIO

03853624 **Image available**
DETECTION METHOD OF LAYER STATE

PUB. NO.: 04-218724 [JP 4218724 A]
PUBLISHED: August 10, 1992 (19920810)
INVENTOR(s): TORIMOTO YOSHIAKI
NAKAMURA JUNICHI
DEN KEIICHI
HASHIMOTO IORI
FUJIWARA TAKESHI
SOTOWA KENICHIROU
APPLICANT(s): KAO CORP [000091] (A Japanese Company or Corporation), JP (Japan)
APPL. NO.: 03-082268 [JP 9182268]
FILED: April 15, 1991 (19910415)
INTL CLASS: [5] G01F-023/00; **G06F-015/18**
JAPIO CLASS: 46.1 (INSTRUMENTATION -- Measurement); 45.4 (INFORMATION PROCESSING -- Computer Applications)
JOURNAL: Section: P, Section No. 1457, Vol. 16, No. 565, Pg. 167, December 07, 1992 (19921207)

ABSTRACT

PURPOSE: To enable a state of a layer to be detected when a plurality of liquid layers are distributed.

CONSTITUTION: A title item is a method for detecting a layer state when upper and lower **different** liquids form layers in a target system, a measurement value which is obtained from the target system in **time** series or a value based on the measurement value is input to a **neuro computer**, a **signal** which is output from the **neurocomputer** is compared with a **signal** which indicates the layer state which is known by actual sampling a this **time**, a weight indicating a strength of combination from an input to an output in the **neurocomputer** is adjusted, an input/output model with the adjusted weight as a coefficient is created, the **measured** value or a value based on the **measured** value is input to the input/output model, and the state of the layer is recognized from the output at this **time**.

14/5/12 (Item 12 from file: 347)
DIALOG(R)File 347:JAPIO

03686272 **Image available**
OPERATION RECOGNITION DEVICE USING **NEURO COMPUTER**

PUB. NO.: 04-051372 [JP 4051372 A]
PUBLISHED: February 19, 1992 (19920219)
INVENTOR(s): USHIYAMA HITOMI
HIROTA KATSUHIKO
MURAKAMI KOICHI
APPLICANT(s): FUJITSU LTD [000522] (A Japanese Company or Corporation), JP (Japan)
APPL. NO.: 02-161533 [JP 90161533]
FILED: June 20, 1990 (19900620)
INTL CLASS: [5] **G06F-015/62** ; **G06F-015/18**
JAPIO CLASS: 45.4 (INFORMATION PROCESSING -- Computer Applications)
JOURNAL: Section: P, Section No. 1363, Vol. 16, No. 241, Pg. 40, June 03, 1992 (19920603)

ABSTRACT

PURPOSE: To recognize an operation having an individual **difference** such

as talking with hands by constituting an operation learning part and an operation recognition part by means of **neuro computers** consisting of input layers, hidden layers, output layers and context layers, and inplanting a learning result to the operation recognition part through a weight storage part.

CONSTITUTION: An operation measurement part 10 measures the three-dimensional movement of hands and outputs it as **time** sequential data. A learning data generation part 14 generates learning data from the **time** sequential data and a teach **signal**. The **neuro computer** 16-1 has a recurrent function and learns a weight from the learning data. The weight storage part 18 stores the weight of network connection at every operation. The weight of the weight storage part 18 is inplanted to the **neuro computer** 16-2 in the operation recognition part 20. When **time** sequential data is inputted from the operation measurement part 10, the **neuro computer** 16-2 executes the algorithm of the recurrent type neural network and outputs a recognition result.

14/5/13 (Item 13 from file: 347)
DIALOG(R)File 347:JAPIO

03555657 **Image available**
PRE-PROCESSING SYSTEM FOR **NEURO - COMPUTER**

PUB. NO.: 03-218557 [JP 3218557 A]
PUBLISHED: September 26, 1991 (19910926)
INVENTOR(s): YOKONO MASAYUKI
APPLICANT(s): FUJITSU LTD [000522] (A Japanese Company or Corporation), JP (Japan)
APPL. NO.: 02-014590 [JP 9014590]
FILED: January 24, 1990 (19900124)
INTL CLASS: [5] **G06F-015/18**
JAPIO CLASS: 45.4 (INFORMATION PROCESSING -- Computer Applications)
JOURNAL: Section: P, Section No. 1290, Vol. 15, No. 503, Pg. 135, December 19, 1991 (19911219)

ABSTRACT
PURPOSE: To reduce the number of times of learning, and to improve recognition rate by inputting **time** series data after removing its DC component by differentiating the **time** series data to the input layer of a **neuro - computer**.
CONSTITUTION: A differentiation unit 1 differentiates the inputted **time** series data, and removes its DC component, and inputs the **time** series data after removing the DC component to the input layer constituting the **neuro - computer** 2. Then, a teacher **signal** is inputted to an output layer in accordance with it, and after repeating the learning, the inference of the event of comming **time**, etc., is executed. Thus, by inputting the **time** series data after eliminating its **variation** due to the DC component by differentiating the **time** series data to the **neuro - computer**, the number of times of the learning can be reduced, and the recognition rate can be improved.

14/5/15 (Item 15 from file: 347)
DIALOG(R)File 347:JAPIO

03283921 **Image available**
AUTOMATIC ANALYZER

PUB. NO.: 02-259421 [JP 2259421 A]
PUBLISHED: October 22, 1990 (19901022)
INVENTOR(s): OHASHI AKINAMI
APPLICANT(s): TOSHIBA CORP [000307] (A Japanese Company or Corporation), JP (Japan)

APPL. NO.: 01-078610 [JP 8978610]
FILED: March 31, 1989 (19890331)
INTL CLASS: [5] G01D-021/00; **G06F-015/18**
JAPIO CLASS: 46.1 (INSTRUMENTATION -- Measurement); 45.4 (INFORMATION PROCESSING -- Computer Applications)
JOURNAL: Section: P, Section No. 1151, Vol. 15, No. 15, Pg. 104, January 11, 1991 (19910111)

ABSTRACT

PURPOSE: To enable attainment of correct judgement on the necessity of re-inspection by interpreting **measured** data of a specimen inspecting apparatus in a **neuro - computer** and by detecting an error in measurement therein.

CONSTITUTION: When **measured** data showing the result of inspection on a specimen are outputted to a **neuro - computer** 2 from a specimen inspecting apparatus 1, the computer 2 determines whether or not an error in measurement is expected from the **measured** data, and outputs to the apparatus 1 the result as to whether re-inspection is needed or not. The apparatus 1 receiving the result of decision of the computer 2 as to the error in measurement in this way can display 4 this result. When an operator P recognizes that the content of display on the device 4 is different from his own judgement, on the occasion, he modifies teaching data by operating a keyboard 5. When the content of display on the device 4 is in accord with judgement of the operator P and shows that the re-inspection is needed, he can execute the re-inspection in accordance with the contents. Then, the **measured** data of the apparatus 1 and the result of decision of the re-inspection by the computer 2 are stored 3.

14/5/16 (Item 16 from file: 347)
DIALOG(R)File 347:JAPIO

03099433 **Image available**
OPTICAL **NEURO - COMPUTER**

PUB. NO.: 02-074933 [JP 2074933 A]
PUBLISHED: March 14, 1990 (19900314)
INVENTOR(s): YOSHINAGA HISAO
KITAYAMA KENICHI
APPLICANT(s): NIPPON TELEGR & TELEPH CORP <NTT> [000422] (A Japanese Company or Corporation), JP (Japan)
APPL. NO.: 63-226355 [JP 88226355]
FILED: September 12, 1988 (19880912)
INTL CLASS: [5] G02F-003/00; **G06E-003/00 ; G06F-015/18**
JAPIO CLASS: 29.2 (PRECISION INSTRUMENTS -- Optical Equipment); 45.1 (INFORMATION PROCESSING -- Arithmetic Sequence Units); 45.4 (INFORMATION PROCESSING -- Computer Applications)
JAPIO KEYWORD:R002 (LASERS); R009 (HOLOGRAPHY)
JOURNAL: Section: P, Section No. 1058, Vol. 14, No. 267, Pg. 88, June 08, 1990 (19900608)

ABSTRACT

PURPOSE: To optically execute an intellectual information processing of a complicated pattern recognition, etc. which necessitate a learning function by constituting the coupling strength of neurones between each layer, of a real **time** hologram, and constituting an intermediate layer, an output layer and an error correcting **signal** generating part, of a space optical modulator or a non-linear light optical element.

CONSTITUTION: When a hologram 28 is irradiated by an optical input **signal** 27, a diffracted light 29 is outputted, and this diffracted light is brought to threshold processing optically by an intermediate layer 6, and thereafter, radiated to a hologram 34, and this diffracted light 36 is brought to threshold processing optically by an output layer 10, and thereafter, outputted as an optical output **signal** 11. On the other hand,

in an error correcting **signal** generating part 13, an error **signal** is generated from a **difference** between the optical output **signal** 11 and a teacher **signal** 12 applied from the outside, and this error **signal** is fed back to the hologram 28 and recorded. That is, by error **signals** 14, 16, weight of coupling between neurones between the intermediate layer 6 and the output layer 10, between an input layer 2 and the intermediate layer 6, and plural intermediate layers 6 is corrected, and learning is executed. In such a way, an optical **neuro - computer** for executing an intellectual information knowledge of a complicated pattern recognition, etc. which necessitate a learning function by utilizing an advantage of a parallel property and a high speed property, etc. can be realized.

14/5/17 (Item 1 from file: 350)
DIALOG(R)File 350:Derwent WPIX

013216035 **Image available**
WPI Acc No: 2000-387909/200033
XRPX Acc No: N00-290353
Oscillatory neuro - computer **for simulating** oscillatory **nature of brain neurons, has conductive medium coupled to connectors, which applies** oscillatory signal **to each** oscillator **via corresponding connector**
Patent Assignee: UNIV ARIZONA STATE (UYAR-N)
Inventor: HOPPENSTEADT F C; IZHIKEVICH E
Number of Countries: 022 Number of Patents: 001
Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week	
WO 200029970	A1	20000525	WO 99US26698	A	19991112	200033	B

Priority Applications (No Type Date): US 98108353 P 19981113
Patent Details:

Patent No	Kind	Lan	Pg	Main IPC	Filing Notes
WO 200029970	A1	E	38	G06F-015/18	

Designated States (National): CN JP KR US
Designated States (Regional): AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE

Abstract (Basic): WO 200029970 A1

NOVELTY - Several connectors (80A-80E) are operably coupled with corresponding **oscillators** (60A-60E). A conductive medium (70) is operably coupled to the connectors, simultaneously applies **oscillatory signal** to each **oscillator** via the connector. A sourcing apparatus with **rhythmic** external forcing input (90) generating an **oscillatory signal** , is operably coupled with the medium.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for communication establishing method between two **oscillator** having **different frequencies** .

USE - For simulating **oscillatory** nature of brain neurons.

ADVANTAGE - **Neuro - computer** can act as a classical fully connected Hopfield network even when there are only interconnections.

DESCRIPTION OF DRAWING(S) - The figure shows the schematic diagram of neural network having five neural processing elements.

Oscillators (60A-60E)
Conductive medium (70)
Connectors (80A-80E)
pp; 38 DwgNo 2/13

Title Terms: **OSCILLATING** ; NEURO; COMPUTER; SIMULATE; **OSCILLATING** ; NATURE; BRAIN; NEURON; CONDUCTING; MEDIUM; COUPLE; CONNECT; APPLY; **OSCILLATING** ; **SIGNAL** ; **OSCILLATOR** ; CORRESPOND; CONNECT
Derwent Class: T01; T02; U23
International Patent Class (Main): **G06F-015/18**
International Patent Class (Additional): **G06F-015/80**
File Segment: EPI

14/5/20 (Item 4 from file: 350)
DIALOG(R)File 350:Derwent WPIX

011353520 **Image available**
WPI Acc No: 1997-331427/199730
XRPX Acc No: N97-275113

Opto-electronic neural network model - has electron-optical indicators with different **radiation spectra mounted on planar photo-resistor modelling neuron soma convergence**

Patent Assignee: LAVRENYUK A F (LAVR-I)
Inventor: LAVRENYUK A F
Number of Countries: 001 Number of Patents: 001
Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week	
RU 2070334	C1	19961210	SU 5036655	A	19920409	199730	B

Priority Applications (No Type Date): SU 5036655 A 19920409
Patent Details:

Patent No	Kind	Lan	Pg	Main IPC	Filing Notes
RU 2070334	C1		12	G06G-007/60	

Abstract (Basic): RU 2070334 C

Model comprises two interconnected opto-electronic operational modelling medium distribution units, and now has additional inverse coupling units, electron-optical indicators. Also, it is now proposed that conversion of optically continuous **signals** into discrete **signals** is carried out in the neurite-type units, and conversion of the optical discrete **signals** into continuous optical **signals** is carried out in the synapse-type units. The optical outputs of the opto-electronic feedback units electron-optical indicators on a planar photoresistor, modelling **divergence** of the optical **signals** , are connected optically to the optical inputs of a planar operational photoresistor modelling convergence of input **signals** . This enables realisation of the function of adaptation and learning in neuron circuits.

USE - Model concerns opto-electronic neuro-type computing structures and is for use as coprocessors in **neuro - computer** systems.

Dwg.1/3

Title Terms: OPTO; ELECTRONIC; NEURAL; NETWORK; MODEL; ELECTRON-OPTICAL; INDICATE; RADIATE; SPECTRUM; MOUNT; PLANE; PHOTO; RESISTOR; MODEL; NEURON ; CONVERGE
Derwent Class: T01; T02
International Patent Class (Main): **G06G-007/60**
File Segment: EPI

14/5/24 (Item 8 from file: 350)
DIALOG(R)File 350:Derwent WPIX

008212550 **Image available**
WPI Acc No: 1990-099551/199013
XRPX Acc No: N90-076923

Neuro - computer **using hierarchical or feedback neural network - has analog neuron processors in** different **layers to permit simultaneous input and parallel computation, thus increasing computation speed**

Patent Assignee: FUJITSU LTD (FUIT)
Inventor: ASAKAWA K; ENDO H; ICHIKI H; ISHIKAWA K; IWAMOTO H; KATO H; KAWASAKI T; MATSUDA T; SUGIURA Y; TSUCHIYA C; TSUZUKI H; YOSHIZAWA H; ICIKI H
Number of Countries: 015 Number of Patents: 011
Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week	
WO 9002381	A	19900308	WO 89JP192	A	19890223	199013	B
FI 9002081	A	19900425				199032	
AU 8931870	A	19900323				199033	
JP 1502606	X	19900906				199042	

EP 400147	A	19901205	EP 89902817	A	19890223	199049
US 5131072	A	19920714	WO 89JP192	A	19890223	199231
			US 90474055	A	19900430	
AU 633812	B	19930211	AU 8931870	A	19890223	199313
KR 9401173	B1	19940216	WO 89JP192	A	19890223	199502
			KR 90700894	A	19900430	
EP 400147	A4	19930127	EP 89902817	A	19890000	199525
EP 400147	B1	19971015	EP 89902817	A	19890223	199746
			WO 89JP192	A	19890223	
DE 68928385	E	19971120	DE 628385	A	19890223	199801
			EP 89902817	A	19890223	
			WO 89JP192	A	19890223	

Priority Applications (No Type Date): JP 88216865 A 19880831
Cited Patents: CA 1042109; CH 620307; DE 2524734; ES 436945; ES 453377; ES 453378; FR 2274088; GB 1457338; IT 1036906; JP 51021749; JP 60012671; JP 62295188; NL 176313; NL 7506761; US 3950733; 1.Jnl.Ref; JP 85012671
Patent Details:

Patent No	Kind	Lan	Pg	Main IPC	Filing Notes
WO 9002381	A	J	167		
Designated States (National): AU FI JP KR US					
Designated States (Regional): AT BE CH DE FR GB IT LU NL SE					
EP 400147	A				
Designated States (Regional): DE FR GB IT NL					
US 5131072	A		75	G06F-015/18	Based on patent WO 9002381
AU 633812	B			G06G-007/60	Previous Publ. patent AU 8931870 Based on patent WO 9002381
EP 400147	B1	E	90	G06G-007/60	Based on patent WO 9002381
Designated States (Regional): DE FR GB IT NL					
DE 68928385	E			G06G-007/60	Based on patent EP 400147 Based on patent WO 9002381
KR 9401173	B1			G06G-007/60	

Abstract (Basic): WO 9002381 A

Time sharing log input **signals** and weight data, which are inputted sequentially via analog **signal** buses, are subjected to sum/product operation. An analog neuron processor (ANP) outputs a **signal** to the analog **signal** buses through a non-linear circuit. The neutral network is controlled by reading required data from a control-pattern memory and required weight data from a weight memory under the control of a microsequencer, to obtain a practically operable **neurocomputer** .

In this **neurocomputer** , a number of ANPs are connected by one analog bus. This enables the number of wires in the neutral network to be reduced greatly and the scale of the circuit to be minimised.

Title Terms: NEURO; COMPUTER; HIERARCHY; FEEDBACK; NEURAL; NETWORK; ANALOGUE; NEURON; PROCESSOR; LAYER; PERMIT; SIMULTANEOUS; INPUT; PARALLEL ; COMPUTATION; INCREASE; COMPUTATION; SPEED
Derwent Class: T01; T02
International Patent Class (Main): **G06F-015/18** ; **G06G-007/60**
File Segment: EPI

```
Set      Items   Description
S1         122   NEURO()COMPUTER? OR NEUROCOMPUTER?
S2      108042   OSCILLAT?
S3      444881   RHYTHMIC? OR METRICAL OR MEASURED OR CADENCED
S4     1118461   DIFFERENCE? ? OR VARIANCE? ? OR VARIATION OR DIVERGENCE OR
              DEVIATION OR DIFFERENT
S5      430951   S4 (S) (FREQENCY OR FREQUENCIES OR SIGNAL? OR WAVE? ? OR P-
              ULSE? ? OR WAVEFORM? ? OR TIME OR PERIODICALLY OR INTERVAL? OR
               DURATION)
S6           1   S1 (S) S2 (S) S3
S7           4   S1 (S) S2
S8           4   S1 (S) S3
S9          12   S1 (S) S5
S10         15   S6:S9
S11          8   S10 AND IC=(G06E? OR G06F? OR G06G?)
File 348:EUROPEAN PATENTS 1978-2004/Oct W03
         (c) 2004 European Patent Office
File 349:PCT FULLTEXT 1979-2002/UB=20041021,UT=20041014
         (c) 2004 WIPO/Univentio
```

11/5,K/1 (Item 1 from file: 348)
DIALOG(R)File 348:EUROPEAN PATENTS

01171018
OSCILLATARY NEUROCOMPUTERS **WITH DYNAMIC CONNECTIVITY**
ORDINATEUR NEUROMIMETIQUE OSCILLATOIRE A CONNECTIVITE DYNAMIQUE
PATENT ASSIGNEE:
Arizona Board Of Regents, a Body corporate acting on behalf of Arizona State University, (2713360), Bank One Building, Suite 201, 20 E. Iniversity,, Tempe, AZ 85282, (US), (Applicant designated States: all)
INVENTOR:
HOPPENSTEADT, Frank, C., 4864 E. Caida Del Sol, Paradise Valley, AZ 85253 , (US)
IZHIKEVICH, Eugene, 2700 N. Hayden Road 2036, Scottsdale, AZ 85257, (US)
PATENT (CC, No, Kind, Date):
WO 200029970 000525
APPLICATION (CC, No, Date): EP 99960287 991112; WO 99US26698 991112
PRIORITY (CC, No, Date): US 108353 P 981113
DESIGNATED STATES: AT; BE; CH; CY; DE; DK; ES; FI; FR; GB; GR; IE; IT; LI; LU; MC; NL; PT; SE
INTERNATIONAL PATENT CLASS: **G06F-015/18 ; G06F-015/80**
LEGAL STATUS (Type, Pub Date, Kind, Text):
Application: 000719 A1 International application. (Art. 158(1))
Application: 000719 A1 International application entering European phase
Application: 020612 A1 International application. (Art. 158(1))
Appl Changed: 020612 A1 International application not entering European phase
Withdrawal: 020612 A1 Date application deemed withdrawn: 20010614
LANGUAGE (Publication,Procedural,Application): English; English; English

OSCILLATARY NEUROCOMPUTERS **WITH DYNAMIC CONNECTIVITY**
INTERNATIONAL PATENT CLASS: **G06F-015/18** ...

... **G06F-015/80**

11/5,K/2 (Item 2 from file: 348)
DIALOG(R)File 348:EUROPEAN PATENTS

00503176
AUTOMATED CYTOLOGICAL SPECIMEN CLASSIFICATION SYSTEM AND METHOD
AUTOMATISCHES ZELLENKLASSIFIKATIONSSYSTEM UND VERFAHREN
SYSTEME ET PROCEDE DE CLASSIFICATION AUTOMATIQUE D'ECHANTILLONS CYTOLOGIQUES
PATENT ASSIGNEE:
NEUROMEDICAL SYSTEMS, INC, (1088051), 2 Executive Blvd. Suite 306, Suffern, NY 10901-4114, (US), (applicant designated states: AT;BE;CH;DE;DK;ES;FR;GB;GR;IT;LI;LU;NL;SE)
INVENTOR:
RUTENBERG, Mark, R., 128 West Maple Ave., Monsey, NY 10952, (US)
HALL, Thomas, L., 330 Cordova, Pasadena, CA 91101, (US)
LEGAL REPRESENTATIVE:
Crisp, David Norman et al (52071), D. YOUNG & CO. 21 New Fetter Lane, London EC4A 1DA, (GB)
PATENT (CC, No, Kind, Date): EP 479977 A1 920415 (Basic)
EP 479977 A1 931020
EP 479977 B1 970716
WO 9115826 911017
APPLICATION (CC, No, Date): EP 91907443 910328; WO 91US2138 910328
PRIORITY (CC, No, Date): US 502611 900330
DESIGNATED STATES: AT; BE; CH; DE; DK; ES; FR; GB; GR; IT; LI; LU; NL; SE
INTERNATIONAL PATENT CLASS: **G06F-015/18 ; G06F-019/00 ; G06F-159/00 ;** G06T-007/00; G06K-009/62
CITED PATENTS (WO A): US 4612614 A; US 4805225 A; US 3333248 A; US 4000417

A; US 4965725 A; US 4591980 A; US 4700298 A; GB 2093586 A
CITED REFERENCES (EP A):
No further relevant documents disclosed;
CITED REFERENCES (WO A):

MIZUNO, H. "A neural network moder for pattern recognition", Proc of the Third Int. Workshop on parallel Processing by Cellular Automata and Arrays, Berlin, GDR, September 9-11,1986, 234-241.

LIPPMANN, R.P. "An Introduction to computing with neural nets", IEEE ASSP Magazine, April 1987, 4-22.

FUKUSHIMA, K. "Neural Network Model for Selective Attention in Visual Pattern Recognition and Associative Recall", Applied Optics, Vol. 26, No. 23, Dec. 1987, 4985-4992.

"Automation of Uterine Cervical Cytology: Accomplishments and Goals" ROSENTHAL, D.L., 1986, Elsevier Science Publishers, 65-72.

"Biology of Disease: Application of Quantitative Microscopy in Tumer Pathology", HALL, T.L. et al. Laboratory Investigation; Vol. 53, No. 1, 1985, 5021.

"Microcomputer-Based Image Processing Workstations for Cytology", HALL T.H. et al. Applied Optics, Vol. 26, No. 16, Aug. 15, 1987 pp. 3266-3269.

"Automated Cervical Smear Classification", TIEN. D. et al. IEEE/Ninth Annual Conference of the Engineering in Medicine and Biology Society, 1987, 1457-8.

"Neurocomputing: Picking the Human Brain", HECHT-NIELSEN, R., IEEE Spectrum, Mar. 1988, 36-41.

KOSS, L.G., "Diagnostic Cytology and Its Histopathologic Bases", J.B. Lippincott Company, Philadelphia 1979, 1152-3.

TANAKA, N. et al., "CYBEST Model 3 Automated Cytologic Screening System for Uterine Cancer Utilizing Image Analysis Processing", Analytical and Quantitative Cytology, Vol. 4, No. 4, Dec. 1982, 279-285, See entire document.

IMASATO, Y. et al. "CYBEST - AUTOMATED PAP SMEAR PRESCREENER", Toshiba Review, (International Edition) No. 100, Nov.-Dec. 1975, 6-63, See entire document.

ROSENTHAL, D. "Critical Review of Potential Neural Nets in Diagnostic Pathology", XII International Meeting of the Society for Analytical Cytology, Breckenridge, Colo. Sep. 1988, 4 pp.

EGBERT, D.D. et al. "Preprocessing of Biomedical Images for Neurocomputer Analysis", IEEE International Conference on Neural Networks, San Diego Calif., Jul. 1988, Vol. 1, pp. 561-68.

DAYHOFF, R.E. et al. "Segmentation of True Color Microscopic Images Using a Back Propagation Neural Network", Neural Networks, Vol. 1, No. 1, Suppl. 1988, 169.

OLDHAM, W.J.B. et al., "Neural Network Recognition of Mammographic Lesions", 73rd Scientific Assembly and Annual Meeting of the Radiological Society of North America, Nov. 1987.

FUKUSHIMA, K. "Self-Organizing Neural Network Models for Visual Pattern Recognition", Acta Neurochir Suppl. (Wein), Vol. 41, 1987, 51-67.;

NOTE:
No A-document published by EPO
LEGAL STATUS (Type, Pub Date, Kind, Text):

Application:	920415	A1	Published application (A1with Search Report ;A2without Search Report)
Examination:	920415	A1	Date of filing of request for examination: 920203
Search Report:	931020	A1	Drawing up of a supplementary European search report: 930902
Examination:	950830	A1	Date of despatch of first examination report: 950718
Grant:	970716	B1	Granted patent
Oppn None:	980708	B1	No opposition filed

LANGUAGE (Publication,Procedural,Application): English; English; English
FULLTEXT AVAILABILITY:

Available Text	Language	Update	Word Count
CLAIMS B	(English)	EPAB97	691
CLAIMS B	(German)	EPAB97	682
CLAIMS B	(French)	EPAB97	728

SPEC B (English) EPAB97 11839
Total word count - document A 0
Total word count - document B 13940
Total word count - documents A + B 13940

INTERNATIONAL PATENT CLASS: **G06F-015/18** ...

... **G06F-019/00** ...

... **G06F-159/00**

...SPECIFICATION should be recognized that while the image processor and digitizer 20b, the general processor 20a, and the **neurocomputer** 82 are described and shown in Figures 3a and 3b operating in a serial manner, in actual...

...functions will be performed in parallel as is possible. Consequently, the components 20b, 82, 20a may process **different** slide segments or **different** areas of a segment concurrently, greatly reducing the **time** required to screen a slide.
Turning to a more in-depth review of the classification method and...

11/5,K/3 (Item 3 from file: 348)
DIALOG(R)File 348:EUROPEAN PATENTS

00434310
Parallel data processing system
Paralleldatenverarbeitungsanlage
Systeme de traitement de donnees en parallele
PATENT ASSIGNEE:
FUJITSU LIMITED, (211460), 1015, Kamikodanaka, Nakahara-ku, Kawasaki-shi, Kanagawa 211, (JP), (applicant designated states: DE;FR;GB)
INVENTOR:
Kato, Hideki, 32-12, Seijo 7-chome, Setagaya-ku, 157, Tokyo, (JP)
Yoshizawa, Hideki, 3-5-1-403, Sakuragaoka, Setagaya-ku,156, Tokyo, (JP)
Iciki, Hiroki, 5-8-2-502, Hakusan, Bunkyo-ku, Tokyo, 112, (JP)
Asakawa. Kazuo, 3-403, Aberia, 2-10-1, Miyamaedaira, Miyamae-ku, Kawasaki-shi, Kanagawa 213, (JP)
LEGAL REPRESENTATIVE:
Fane, Christopher Robin King et al (30511), Haseltine Lake & Co., Imperial House, 15-19 Kingsway, London WC2B 6UD, (GB)
PATENT (CC, No, Kind, Date): EP 421639 A2 910410 (Basic)
EP 421639 A3 930804
EP 421639 B1 980422
APPLICATION (CC, No, Date): EP 90310302 900920;
PRIORITY (CC, No, Date): JP 89243972 890920; JP 89243971 890920; JP 89243970 890920; JP 89243969 890920
DESIGNATED STATES: DE; FR; GB
INTERNATIONAL PATENT CLASS: **G06F-015/16 ; G06F-015/80**
CITED PATENTS (EP A): EP 147857 A; EP 147857 A; EP 236762 A; EP 236762 A; US 4524455 A
CITED REFERENCES (EP A):
NEURAL NETWORKS FROM MODELS TO APPLICATIONS E.S.P.C.I. June 1988, PARIS , FRANCE pages 682 - 691 PERSONNAZ 'Towards a neural network chip : A performance assessment and a simple example'
IEEE INTERNATIONAL CONFERENCE ON NEURAL NETWORKS vol. 2, 24 July 1988, SAN DIEGO , USA pages 165 - 172 KUNG 'Parallel architectures for artificial neural nets';

ABSTRACT EP 421639 A2
A parallel data processing system comprises a plurality of data processing units (1-1, 1-2, ... 1-m), each having at least one input (11-1, 11-2, ... 11-m) and storing data of a matrix, and a plurality of trays (2-1, 2-2, ... 2-n) each having a first input (21) and an output (22) and for storing data of a vector, each of all or part of said trays

having a second output (23) connected to said first input (11-1, 11-2, ... 11-m) of a respective one of said data processing units, and said trays being connected in cascade (3) to form a shift means and means for performing data transfer through the shift means, data transfer between corresponding ones of the trays and the data processing units and data processing in the data processing units synchronously, thereby performing an operation of a matrix vector product or a neuron computer operation on analog signals. (see image in original document)
ABSTRACT WORD COUNT: 160

LEGAL STATUS (Type, Pub Date, Kind, Text):

Application:	910410 A2	Published application (Alwith Search Report ;A2without Search Report)
Search Report:	930804 A3	Separate publication of the European or International search report
Examination:	940330 A2	Date of filing of request for examination: 940127
Examination:	960515 A2	Date of despatch of first examination report: 960402
Grant:	980422 B1	Granted patent
Oppn None:	990414 B1	No opposition filed

LANGUAGE (Publication,Procedural,Application): English; English; English
FULLTEXT AVAILABILITY:

Available Text	Language	Update	Word Count
CLAIMS B	(English)	9817	1998
CLAIMS B	(German)	9817	1792
CLAIMS B	(French)	9817	2164
SPEC B	(English)	9817	15921
Total word count - document A			0
Total word count - document B			21875
Total word count - documents A + B			21875

INTERNATIONAL PATENT CLASS: **G06F-015/16** ...

... **G06F-015/80**

...SPECIFICATION 7A illustrates of a fourth embodiment of the present invention. The present embodiment is directed to a **neuro - computer** . In the figure, like reference characters are used to designate corresponding parts to those in Figure 6...

...1 and the trays 2. 5a designates a clock generator which may be constructed from a crystal **oscillator** , and 5b designates a clock distributor which may be constructed from a buffer circuit. In addition, 101...

...end of learning on the basis of a plurality of values of output errors to bring the **neuro - computer** to a stop. 102 designates the whole of the **neuro - computer** .

Figure 7B illustrates a neuron model which is a basic element of the neuro-computer of the...

...the nonlinear function f.

Figure 7C is a conceptual diagram of a hierarchical neural network constituting a **neuro - computer** of a three-layer structure comprised of an input layer, an intermediate layer and an output layer...

...layer. The outputs are drawn to the outside. In this neural network, an error between a teacher **signal** corresponding to input pattern signals applied to the input layer at the **time** of learning and an output **signal** from the output layer is obtained. The weights between the intermediate layer and the output layer and...

...weight values determined by the law of back propagation learning, if an imperfect pattern which is slightly **different** from a pattern to be recognized is applied to the inputs of the first layer, an output **signal** corresponding to the pattern is output from the output layer. The

signal is very similar to a teacher **signal** corresponding to the pattern applied at the **time** of learning. If the **difference** between the output **signal** and the teacher **signal** is very small, the imperfect pattern will become recognized.

The operation of the neural network can be...Figure 7E is a flowchart of the learning process in the fourth embodiment. The learning in the **neuro - computer** serves to correct the weight of earh neuron until the network satisfies a desired input and output relationship. The method of learning is to prepare a plurality of pairs of an input **signal** vector and a teacher **signal** vector, namely, the number of the pairs corresponds to the number of teacher signals in a teacher **signal** set. Then, one pair is selected from among the pairs, its input **signal** Ip)) is entered into the network as an object of learning and the output of the network for that input is compared with the correct output **signal** , that is, the teacher **signal** Op)) corresponding to the input **signal** . The **difference** is referred to as an error. The weights of the neurons are corrected on the basis of the error and the values of the input and output signals at that **time** . This process is repeated for each element of the set of teacher signals until the learning converges...

11/5,K/4 (Item 1 from file: 349)

DIALOG(R)File 349:PCT FULLTEXT

00566597 **Image available**

OSCILLATARY NEUROCOMPUTERS **WITH DYNAMIC CONNECTIVITY**

ORDINATEUR NEUROMIMETIQUE OSCILLATOIRE A CONNECTIVITE DYNAMIQUE

Patent Applicant/Assignee:
  ARIZONA BOARD OF REGENTS a body corporate acting;on behalf of ARIZONA STATE UNIVERSITY,
  HOPPENSTEADT Frank C,
  IZHIKEVICH Eugene,

Inventor(s):
  HOPPENSTEADT Frank C,
  IZHIKEVICH Eugene,

Patent and Priority Information (Country, Number, Date):
  Patent: WO 200029970 A1 20000525 (WO 0029970)
  Application: WO 99US26698 19991112 (PCT/WO US9926698)
  Priority Application: US 98108353 19981113

Designated States:
(Protection type is "patent" unless otherwise stated - for applications prior to 2004)
  CN JP KR US AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE

Main International Patent Class: **G06F-015/18**
International Patent Class: **G06F-015/80**
Publication Language: English
Fulltext Availability:
  Detailed Description
  Claims
Fulltext Word Count: 5178

English Abstract

A **neurocomputer** (50) comprises n **oscillating** processing elements (60A, 60B, 60C, 60D and 60E) that communicate through a common medium (70) so that there are required only n connective junctions (80A, 80B, 80C, 80D and 80E). A **rhythmic** external forcing input (90) modulates the **oscillatory** frequency of the medium (70) which, in turn, is imparted to the n **oscillators** (60A, 60B, 60C, 60D and 60E). Any two **oscillators** **oscillating** at **different** **frequencies** may communicate provided that input's power spectrum includes the frequency equal to the **difference** between the **frequencies** of the two **oscillators** in question. Thus, selective communication, or dynamic connectivity, between **different** **neurocomputer** **oscillators** occurs due to the frequency modulation of the medium (70) by external forcing.

French Abstract

Cet ordinateur neuromimetique (50) comprend n elements de traitement oscillants (60A, 60B, 60C, 60D et 60E) qui communiquent par l'intermediaire d'un support commun (70) de sorte que seulement n jonctions de connexion (80A, 80B, 80C, 80D et 80E) sont necessaires. L'entree d'une contrainte, exterieure, rythmique (90) module la frequence oscillatoire du support (70), laquelle est a son tour appliquee aux n oscillateurs (60A, 60B, 60C, 60D et 60E). Deux oscillateurs quelconques, oscillant a des frequences differentes, peuvent communiquer pourvu que le spectre de la puissance d'entree comprenne la frequence egale a la difference entre les frequences des deux oscillateurs en question. Ainsi, il se produit une communication selective, ou une connectivite dynamique, entre differents oscillateurs de l'ordinateur neuromimetique, par suite de la modulation de frequence du support (70) au moyen d'une contrainte exterieure.

OSCILLATARY NEUROCOMPUTERS **WITH DYNAMIC CONNECTIVITY**

Main International Patent Class: **G06F-015/18**
International Patent Class: **G06F-015/80**
Fulltext Availability:
Detailed Description
Claims

English Abstract

A **neurocomputer** (50) comprises n **oscillating** processing elements (60A, 60B, 60C, 60D and 60E) that communicate through a common medium (70) so that there are required only n connective junctions (80A, 80B, 80C, 80D and 80E). A **rhythmic** external forcing input (90) modulates the **oscillatory** frequency of the medium (70) which, in turn, is imparted to the n **oscillators** (60A, 60B, 60C, 60D and 60E). Any two **oscillators** **oscillating** at **different** **frequencies** may communicate provided that input's power spectrum includes the frequency equal to the **difference** between the **frequencies** of the two **oscillators** in question. Thus, selective communication, or dynamic connectivity, between **different** **neurocomputer** **oscillators** occurs due to the frequency modulation of the medium (70) by external forcing.

Detailed Description

OSCILLATORY **NEUROCOMPUTERS** WITH DYNAMIC CONNECTIVITY

The present application claims priority rights based on U.S. Provisional Application Serial No...

...input I 0 vector produces the desired output vector.

Because of their ability to simulate the apparently **oscillatory** nature of brain neurons, **oscillatory** **neurocomputers** are among the more promising types of **neurocomputers** . Simply stated, the elements of an **oscillatory** **neurocomputer** consist of **oscillators** rather than amplifiers or switches. **Oscillators** are mechanical, chemical or electronic devices that are described by an **oscillatory** **signal** (periodic, quasi-periodic, almost periodic function, etc.). Usually the output is a scalar function of the form V((ot+@) where V is a fixed **wave** forin (sinusoid, saw-tooth or square **wave**), 0) is the frequency of **oscillation** , and @ is the phase **deviation** (lag or lead).

Recurrent neural networks have feedback paths from their outputs back to their inputs. As...

...connective junctions for every n processing elements employed thereby.

In a preferred embodiment of the invention, the **neurocomputer** comprises n **oscillating** processing elements that can communicate through a common medium so that there are required only n connective junctions. A **rhythmic** external forcing input modulates the **oscillatory** frequency of the medium which, in turn, is imparted to the n **oscillators** . Any two **oscillators** **oscillating** at **different** **frequencies** may communicate provided that the input's power spectrum includes the frequency equal to

the **difference** between the **frequencies** of the two **oscillators** in question. Thus, selective communication, or dynamic connectivity, between **different neurocomputer oscillators** occurs due to frequency modulation of the medium by external forcing.

3

BRIEF DESCRIPTION OF THE DRAWING...on the input.

I 0 DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. I schematically illustrates a conventional recurrent **neurocomputer** 10 comprising n (in this case, n=5) neural processing elements 20. Elements 20 may comprise switches, amplifiers, **oscillators** or any other suitable **neurocomputer** element type known in the art. In order for each of elements 20 to communicate with the others 1 5 of elements 20, **neurocomputer** 10 necessarily includes n 2 (in this case, n 2 =25) connective junctions 30 to which conductors...

...can be observed, where the number n of elements 20 grows large, the implementation of such a **neurocomputer** becomes prohibitively difficult, from both cost and practicability standpoints.

FIG. 2 schematically illustrates a **neurocomputer** 50 according to principles of the present invention. **Neurocomputer** 50 comprises a finite number n (in this case, n=5) **oscillatory** neural processing elements 60A, 6013, 60C, 60D and 60E. Elements 60A, 6013, 60C, 60D and 60E can comprise voltage-controlled **oscillators** , optical **oscillators** , lasers, microelectromechanical systems, Josephson junctions, macromolecules, or any other suitable **oscillator** known in the art. Each element 60A, 6013, 60C, 60D and 60E **oscillates** at a particular frequency that may or may not be the same frequency as that of

5

the others of elements 60A, 6013, 60C, 60D and 60E. In its most general sense, the **neurocomputer** 50 further comprises a medium 70 connected to each of elements 60A, 6013, 60C, 60D and 60E...

...80B, 80C, 80D and 80E, respectively. Medium 70 may comprise a unitary body or multiple connected bodies.

Neurocomputer 50 further comprises a **rhythmic** forcing signal source 90 able to apply a modulated **oscillatory** frequency to medium 70 by means of a connection 100.

Specifically, the medium 70 can be a...

...70 enables elements 60B and 60E to communicate data to each other.

Mathematical analysis of the said **neurocomputer** architecture, which is based on the theory developed by F. C. Hoppensteadt and E. M. Izhikevich (**Oscillatory neurocomputers** with dynamic connectivity, Physical Review Letters 82(1999)29832986) shows that the neurocornputer dynamic is equivalent to...

...mechanisms and architectures, Neural Networks 1(1988)17-61) to show that a network of n = 60 **oscillators** can memorize and successfully retrieve through associative recall three patterns corresponding to the images 11011, "I 1% 112", as we illustrate in Figure 3. Thus, the **neurocomputer** can act as a classical fully connected Hopfield network despite the fact that it has only n...form (4) with cij = sij for all i andj.

(vi) Initializing the Network

To use the proposed **neurocomputer** architecture to implement the standard HopfieldGrossberg paradigm, as we illustrate in FIG. 3, we need a way...

...field activity," the former task requires some ingenuity since we do not have direct access to the **oscillators** .

Suppose we are given a vector e E Rn to be recognized. Let us apply the external...

Claim
... of
said connectors being operably coupled with a corresponding one of said elements.

3 The **neurocomputer** of claim 1, wherein:
said forcing apparatus comprises a **rhythmic** input.

4 The **neurocomputer** of claim 1, wherein:
said elements comprise **oscillators** .

5. A **neurocomputer** comprising:
a plurality of n **oscillating** processing elements;
a plurality of no more than n connectors, each of said connectors being operably coupled with a corresponding one of said elements;
a conductive medium operably coupled with said connectors; and
a **rhythmic** input operably coupled with said medium.

6 A **neurocomputer** comprising:
a plurality of n processing element means;
a plurality of connectors operably coupled with said element means;
1 8
means for simultaneously applying an **oscillatory** signal to each of said element means via said connectors; and
means for generating said **oscillatory** signal operably coupled with said means for applying.

7 The neurocomputer of claim 6, wherein:
said plurality...

...each of said
connectors being operably coupled with a corresponding one of said element means.

8 The **neurocomputer** of claim 6, wherein:
said element means comprise **oscillators** .

9. The **neurocomputer** of claim 6, wherein:
said means for applying comprises a conductive medium.

10 The **neurocomputer** of claim 6, wherein:
said means for generating comprises a **rhythmic** input.

11 An **oscillatory** **neurocomputer** comprising:
a number n of **oscillating** elements
a source of a **rhythmic** forcing input,
a medium interconnecting the source of **rhythmic** forcing input to each
oscillating element,
each **oscillating** element having an **oscillating** frequency,
the **oscillating** frequency f, of at least one of the **oscillating** elements differing from the **oscillating** frequency f2 of at least one other of the **oscillating**
elements,
19
the source of a **rhythmic** forcing input producing an input of a third frequency f3, establishing communication between the at least one **oscillating** element and the at least one other **oscillating** element.

12 An **oscillatory** **neurocomputer** according to claim I 1, wherein f3 is substantially the difference between f, and f2.

13 An **oscillatory** **neurocomputer** according to claim 1 1, ftirther comprising a number nj of connections of the source of a **rhythmic** forcing input to the **oscillating**
elements, wherein

'nj <n. I 0 14. An **oscillatory** **neurocomputer** according to claim 12, further comprising a number n, of connections of the source of a **rhythmic** forcing input to the **oscillating**
elements, wherein
nj < n.

15 An **oscillatory** **neurocomputer** according to claim I 1, wherein the **oscillating** elements are electronic **oscillators** , the source of a **rhythmic** forcing input is a function generator and the interconnecting medium is an electrically conductive medium electrically connecting the source of a **rhythmic** forcing input to the **oscillators** .

16 An **oscillatory** **neurocomputer** according to claim 15, wherein the function generator provides a forcing signal having a carrier frequency and information content modulating the carrier frequency, the **oscillators** responding to the impression of the forcing signal onto the conductive medium to produce inforination content modulation substantially the same as that of the conductive medium.

17 An **oscillatory** **neurocomputer** according to claim I 1, wherein the
number
n of
20
oscillating elements is greater than two, a first subset of the **oscillating** elements communicate at a frequency f3 of **rhythmic** forcing input from the source, and at least one second subset of the **oscillating** elements communicate at least one further frequency f4 of **rhythmic** forcing input from the source.

18 An **oscillatory** **neurocomputer** according to claim 15, wherein
content
varying one
oscillator from its **oscillating** frequency is communicated to and varies from its **oscillating** frequency another **oscillator** in communication with the one **oscillator** .

19 A **neurocomputer** including:
I 0 (a) an array of **oscillators** , at least a plurality of said **oscillators** having
differing frequencies,
(b) a common conducting medium connected to each of the plurality
of
oscillators ,
(c) a source connected to the conducting medium to impart **oscillator**
signals
of various frequencies to the conducting medium, the signals of various frequencies including frequencies effective to bring two or more of the **oscillators** into communication.

20 An **oscillatory** **neurocomputer** according to claim 19, wherein the **oscillators** include feedback circuits connected with the medium.

21 An **oscillatory** **neurocomputer** according to claim 20, wherein the **oscillators** are phase locked loops.
21
. A method of enabling communication of a characteristic between a first processing element **oscillating** at a first frequency and a second processing element **oscillating** at a second frequency different from the first frequency, the method comprising the steps of
operably coupling...

...to a medium;
operably coupling the second element to said medium;
operably coupling said medium to a **rhythmic** input; and
causing said **rhythmic** input to **oscillate** said medium at a third frequency.

Set	Items	Description
S1	0	NEURO()COMPUTER? OR NEUROCOMPUTER?
S2	29	OSCILLAT?
S3	189	RHYTHMIC? OR METRICAL OR MEASURED OR CADENCED
S4	14759	FREQUENCY OR FREQUENCIES OR SIGNAL? OR WAVE? ? OR PULSE? ? OR WAVEFORM? ? OR TIME OR PERIODICALLY OR INTERVAL? OR DURATI- ON
S5	4796	DIFFERENCE? ? OR VARIANCE? ? OR VARIATION OR DIVERGENCE OR DEVIATION OR DIFFERENT

File 256:TecInfoSource 82-2004/Jul

```
Set     Items   Description
S1       2066   NEURO()COMPUTER? OR NEUROCOMPUTER?
S2     481590   OSCILLAT?
S3    1324948   RHYTHMIC? OR METRICAL OR MEASURED OR CADENCED
S4    6714260   FREQUENCY OR FREQUENCIES OR SIGNAL? OR WAVE? ? OR PULSE? ?
             OR WAVEFORM? ? OR TIME OR PERIODICALLY OR INTERVAL? OR DURATI-
             ON
S5    3793126   DIFFERENCE? ? OR VARIANCE? ? OR VARIATION OR DIVERGENCE OR
             DEVIATION OR DIFFERENT
S6          1   S1 AND S2 AND S3
S7         35   S1 AND S2
S8         22   S1 AND S3
S9        611   S1 AND S4
S10        53   S9 AND S5
S11       105   S6 OR S7 OR S8 OR S10
S12        73   S11 NOT PY>1999
S13        73   S12 NOT PD>19991112
S14        66   RD (unique items)
File   8:Ei Compendex(R) 1970-2004/Oct W3
         (c) 2004 Elsevier Eng.  Info. Inc.
File  35:Dissertation Abs Online 1861-2004/Sep
         (c) 2004 ProQuest Info&Learning
File 202:Info. Sci. & Tech. Abs. 1966-2004/Sep 09
         (c) 2004 EBSCO Publishing
File  65:Inside Conferences 1993-2004/Oct W4
         (c) 2004 BLDSC all rts. reserv.
File   2:INSPEC 1969-2004/Oct W3
         (c) 2004 Institution of Electrical Engineers
File 233:Internet & Personal Comp. Abs. 1981-2003/Sep
         (c) 2003 EBSCO Pub.
File  94:JICST-EPlus 1985-2004/Sep W4
         (c)2004 Japan Science and Tech Corp(JST)
File  99:Wilson Appl. Sci & Tech Abs 1983-2004/Sep
         (c) 2004 The HW Wilson Co.
File  95:TEME-Technology & Management 1989-2004/Jun W1
         (c) 2004 FIZ TECHNIK
File 583:Gale Group Globalbase(TM) 1986-2002/Dec 13
         (c) 2002 The Gale Group
```

14/5/5 (Item 5 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

03790931 E.I. No: EIP94011176904
Title: Epilepsy in a chaos neuro - computer **model**
Author: Inoue, Masayoshi; Nakamoto, Kenji
Corporate Source: Kagoshima Univ., Kagoshima, Jpn
Conference Title: Chaos in Biology and Medicine
Conference Location: San Diego, CA, USA Conference Date: 19930712-19930713
Sponsor: SPIE - Int Soc for Opt Engineering, Bellingham, WA USA
E.I. Conference No.: 19894
Source: Proceedings of SPIE - The International Society for Optical Engineering v 2036 1993. Publ by Society of Photo-Optical Instrumentation Engineers, Bellingham, WA, USA. p 77-85
Publication Year: 1993
CODEN: PSISDG ISSN: 0277-786X ISBN: 0-8194-1285-6
Language: English
Document Type: CA; (Conference Article) Treatment: T; (Theoretical)
Journal Announcement: 9403W2
Abstract: A network of chaos elements has been presented as an information processor where each element consists of two **oscillators** and it acts as a neuron by making use of the synchronized state of the two **oscillators** . The model is considered as a dynamical model of the brain, and brain dynamics is metaphorically analyzed with the use of the model. The time sequences of Hopfield's energy, which are generated by the network when it solves a traveling salesman problem, are investigated with the use of a fluctuation spectrum theory. The change of the energy reflects the active motion of neurons, and we consider that the time sequence corresponds to a brain wave. If the control parameters of the neuron are chosen properly, the model can efficiently find the solution where a low intermittent ?brain wave' is observed. On the other hand, the model will have epileptic fits if a certain control parameter takes a small value. 20 Refs.
Descriptors: *Bioelectric phenomena; Chaos theory; Neural networks; Mathematical models; Computer simulation
Identifiers: Epilepsy; Chaos **neuro - computer** models
Classification Codes:
461.1 (Biomedical Engineering); 723.5 (Computer Applications)
461 (Biotechnology); 921 (Applied Mathematics); 723 (Computer Software)
46 (BIOENGINEERING); 92 (ENGINEERING MATHEMATICS); 72 (COMPUTERS & DATA PROCESSING)

14/5/10 (Item 10 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

02918976 E.I. Monthly No: EIM9006-025444
Title: Neurocomputer **interfaces and performance measures.**
Author: Hecht-Nielsen, Robert
Corporate Source: HNC Inc, San Diego, CA, USA
Conference Title: IEEE International Symposium on Circuits and Systems 1989, the 22nd ISCAS. Part 1
Conference Location: Portland, OR, USA Conference Date: 19890508
E.I. Conference No.: 13146
Source: Proceedings - IEEE International Symposium on Circuits and Systems v 1. Publ by IEEE, IEEE Service Center, Piscataway, NJ, USA. Available from IEEE Service Cent (cat n 89CH2692-2), Piscataway, NJ, USA. p 74-77
Publication Year: 1989
CODEN: PICSDI ISSN: 0271-4310
Language: English
Document Type: PA; (Conference Paper) Treatment: A; (Applications); G; (General Review)

Journal Announcement: 9006
Abstract: A brief discussion of methods for interfacing **neurocomputers** with host computers is presented, followed by a discussion of **neurocomputer** performance measures. Both of these issues are central to the development of **neurocomputers** to support neural network research as well as the development and deployment of practical applications of neurocomputing. In using the author's **neurocomputer** performance measures, a methodology that starts with operational requirements assessment is often a useful approach. The first step is to define the class of applications that are to be solved by the **neurocomputer** . From these, a list of neural networks of specified architectural types and sizes that will have to run (along with duty-cycle information such as the expected mean and standard **deviation** of the **time** durations of the runs for each network, as well as the expected **frequency** of those runs as a function of the **time** of day). The end result of this analysis is a table expressing the neural network implementation requirements that must be met by the **neurocomputer** . 7 Refs.
Descriptors: *COMPUTER INTERFACES--*Design; SYSTEMS SCIENCE AND CYBERNETICS--Neural Nets; COMPUTER NETWORKS
Identifiers: **NEUROCOMPUTER** INTERFACES; HOST COMPUTERS; **NEUROCOMPUTER** PERFORMANCE MEASURES; NEURAL NETWORK
Classification Codes:
722 (Computer Hardware); 723 (Computer Software)
72 (COMPUTERS & DATA PROCESSING)

14/5/19 (Item 2 from file: 65)
DIALOG(R)File 65:Inside Conferences

00892023 INSIDE CONFERENCE ITEM ID: CN008693468
Relaxation oscillations **in cycle reactions. General consideration**
Grushevskaja, G. V.
CONFERENCE: Brain, mind and neurocomputers-1st Workshop
ADVANCES IN SYNERGETICS, 1994; VOL 1 P: 151-161
Belarussian State University Press, 1994
LANGUAGE: English DOCUMENT TYPE: Conference Papers
CONFERENCE EDITOR(S): Krylov, G.
CONFERENCE SPONSOR: State University of Belarussia
European Humanitarian University
CONFERENCE LOCATION: Minsk
CONFERENCE DATE: Nov 1993 (199311) (199311)

BRITISH LIBRARY ITEM LOCATION: 0711.595450
DESCRIPTORS: brain; mind; **neurocomputers**

14/5/22 (Item 2 from file: 2)
DIALOG(R)File 2:INSPEC

6249941 INSPEC Abstract Number: A1999-12-8730-012, B1999-06-7500-007, C1999-06-7330-315
Title: Oscillatory neurocomputers **with dynamic connectivity**
Author(s): Hoppensteadt, F.C.; Izhikevich, E.M.
Author Affiliation: Center for Syst. Sci. & Eng., Arizona State Univ., Tempe, AZ, USA
Journal: Physical Review Letters vol.82, no.14 p.2983-6
Publisher: APS,
Publication Date: 5 April 1999 Country of Publication: USA
CODEN: PRLTAO ISSN: 0031-9007
SICI: 0031-9007(19990405)82:14L.2983:ONWD;1-K
Material Identity Number: P096-1999-016
U.S. Copyright Clearance Center Code: 0031-9007/99/82(14)/2983(4)$15.00
Document Number: S0031-9007(99)08813-4
Language: English Document Type: Journal Paper (JP)
Treatment: Theoretical (T)

Abstract: The authors' study of thalamo-cortical systems suggests a new architecture for a **neurocomputer** that consists of **oscillators** having **different frequencies** and that are connected weakly via a common medium forced by an external input. Even though such **oscillators** are all interconnected homogeneously, the external input imposes a dynamic connectivity. The authors use Kuramoto's model to illustrate the idea and to prove that such a **neurocomputer** has **oscillatory** associative properties. Then, they discuss a general case. The advantage of such a **neurocomputer** is that it can be built using voltage controlled **oscillators** , optical **oscillators** , lasers, microelectromechanical systems, Josephson junctions, macromolecules, or **oscillators** of other kinds. (16 Refs)
Subfile: A B C
Descriptors: biocomputers; brain models; macromolecules; micromechanical devices; neurophysiology; **oscillators** ; voltage-controlled **oscillators**
Identifiers: **oscillatory** **neurocomputers** ; dynamic connectivity; thalamo-cortical systems; external input; homogeneously interconnected **oscillators** ; Kuramoto's model; **oscillatory** associative properties; optical **oscillators** ; lasers; microelectromechanical systems; Josephson junctions
Class Codes: A8730 (Biophysics of neurophysiological processes); B7500 (Medical physics and biomedical engineering); B1230B (Oscillators); C7330 (Biology and medical computing)

14/5/27 (Item 7 from file: 2)
DIALOG(R)File 2:INSPEC

5576964 INSPEC Abstract Number: B9706-1295-018, C9706-5190-019
Title: Neuron-MOS temporal winner search hardware for fully-parallel data processing
Author(s): Shibata, T.; Nakai, T.; Morimoto, T.; Kaihara, R.; Yamashita, T.; Ohmi, T.
Author Affiliation: Dept. of Electron. Eng., Tohoku Univ., Sendai, Japan
Conference Title: Advances in Neural Information Processing 8. Proceedings of the 1995 Conference p.685-91
Editor(s): Touretzky, D.S.; Mozer, M.C.; Hasselmo, M.E.
Publisher: MIT Press, Cambridge, MA, USA
Publication Date: 1996 Country of Publication: USA xix+1098 pp.
ISBN: 0 262 20107 0 Material Identity Number: XX96-02161
Conference Title: Proceedings of 1995 Conference on Advances in Neural Information Processing Systems 8 (ISBN 0 262 20107 0)
Conference Date: 27-30 Nov. 1995 Conference Location: Denver, CO, USA
Language: English Document Type: Conference Paper (PA)
Treatment: Practical (P)
Abstract: A unique architecture of a winner search hardware has been developed using a novel neuron-like high-functionality device called the neuron-MOS transistor (or nu MOS for short) as a key circuit element. The circuits developed in this paper can find the location of the maximum (or minimum) signal among a number of input data on a continuous-time basis, thus enabling real-time winner tracking as well as fully-parallel sorting of multiple input data. We have developed two circuit schemes. One is an ensemble of self-loop-selecting nu MOS ring **oscillators** , finding the winner as an **oscillating** node. The other is an ensemble of nu MOS variable-threshold inverters, receiving a common ramp-voltage for competitive excitation, where data sorting is conducted through consecutive winner search actions. Test circuits were fabricated by a double-polysilicon CMOS process and their operation has been experimentally verified. (10 Refs)
Subfile: B C
Descriptors: analogue processing circuits; CMOS analogue integrated circuits; continuous time systems; invertors; MOSFET; neural chips; neural net architecture; optimisation; **oscillators** ; parallel architectures; search problems; sorting
Identifiers: neuron-MOS transistor; temporal winner search hardware;

fully-parallel data processing; **neurocomputer** architecture; neuron-like high-functionality device; **oscillating** node; circuit element; maximum signal location; minimum signal location; continuous-time basis; real-time winner tracking; multiple input data sorting; self-loop-selecting nu MOS ring **oscillators** ; nu MOS variable-threshold inverters; common ramp-voltage; competitive excitation; consecutive winner search actions; double-polysilicon CMOS process; winner-take-all circuit

Class Codes: B1295 (Neural nets (circuit implementations)); B2570D (CMOS integrated circuits); B1285 (Analogue processing circuits); B1230B (Oscillators); B0250 (Combinatorial mathematics); B2560R (Insulated gate field effect transistors); C5190 (Neural net devices); C5160 (Analogue circuits); C1160 (Combinatorial mathematics); C5220P (Parallel architecture)

14/5/32 (Item 12 from file: 2)

DIALOG(R)File 2:INSPEC

04037009 INSPEC Abstract Number: C9201-7430-009

Title: A chaos neuro - computer

Author(s): Inoue, M.; Nagayoshi, A.

Author Affiliation: Dept. of Phys., Kagoshima Univ., Japan

Journal: Physics Letters A vol.158, no.8 p.373-6

Publication Date: 16 Sept. 1991 Country of Publication: Netherlands

CODEN: PYLAAG ISSN: 0375-9601

U.S. Copyright Clearance Center Code: 0375-9601/91/$03.50

Language: English Document Type: Journal Paper (JP)

Treatment: Theoretical (T)

Abstract: A network of 'coupled chaos **oscillators** ' is presented as an information processor where the **oscillators** act as a neuron. The network runs on a deterministic rule, but it has the ability of stochastic search. Parallel synchronous computation can be carried out on the digital network and its power is illustrated. (7 Refs)

Subfile: C

Descriptors: chaos; neural nets; stochastic processes; virtual machines

Identifiers: parallel synchronous computation; virtual machines; chaos **neuro - computer** ; coupled chaos **oscillators** ; information processor; neuron; deterministic rule; stochastic search; digital network

Class Codes: C7430 (Computer engineering); C5290 (Neural computing techniques); C1250 (Pattern recognition); C1290 (Applications of systems theory); C1140Z (Other and miscellaneous)

14/5/35 (Item 1 from file: 94)

DIALOG(R)File 94:JICST-EPlus

04856937 JICST ACCESSION NUMBER: 98A0924107 FILE SEGMENT: JICST-E

Fabrication of ferroelectric-gate FETs and their applications to neuron circuits.

ISHIHARA HIROSHI (1); TOKUMITSU EISUKE (1); YOON S-M (1)

(1) Tokyo Inst. of Technol.

Denshi Joho Tsushin Gakkai Taikai Koen Ronbunshu(Proceedings of the IEICE General Conference (Institute of Electronics, Information and Communication Engineers), 1998, VOL.1998,sosaieti C2, PAGE.180-181, FIG.5, REF.2

JOURNAL NUMBER: G0508AEP

UNIVERSAL DECIMAL CLASSIFICATION: 681.3:007.52

LANGUAGE: Japanese COUNTRY OF PUBLICATION: Japan

DOCUMENT TYPE: Conference Proceeding

ARTICLE TYPE: Short Communication

MEDIA TYPE: Printed Publication

DESCRIPTORS: ferroelectrics; neuron; **neurocomputer** ; gate(semiconductor); FET; **oscillator** (circuit); synapse; neural network; logic element

BROADER DESCRIPTORS: dielectrics; dielectric material; material; nerve

tissue; animal tissue; biomedical tissue; organization; computer; hardware; electrode; transistor; semiconductor device; solid state device; signal generator; network; functional device
CLASSIFICATION CODE(S): JC06010Q

14/5/36 (Item 2 from file: 94)
DIALOG(R)File 94:JICST-EPlus

04747033 JICST ACCESSION NUMBER: 93A0888998 FILE SEGMENT: JICST-E
Learning LSI Employing Multifrequency Oscillation **Method for Analog Neural Network.**
Denshi Joho Tsushin Gakkai Taikai Koen Ronbunshu(Proceedings of the IEICE General Conference (Institute of Electronics, Information and Communication Engineers), 1993, VOL.1993,NO.Shuki Pt 5, PAGE.5.164, FIG.4, REF.6
JOURNAL NUMBER: G0508AEP
UNIVERSAL DECIMAL CLASSIFICATION: 681.3:007.52 621.382.2/.3.049.77
LANGUAGE: Japanese COUNTRY OF PUBLICATION: Japan
DOCUMENT TYPE: Conference Proceeding
ARTICLE TYPE: Short Communication
MEDIA TYPE: Printed Publication
DESCRIPTORS: semiconductor chip; learning; circuit design; analog method; neural network; LSI; CMOS structure; **neurocomputer**
IDENTIFIERS: neuro chip
BROADER DESCRIPTORS: solid state circuit parts; circuit component; parts; electric apparatus and parts; chip; design; method; network; integrated circuit; micro circuit; MOS structure; device structure; computer; hardware
CLASSIFICATION CODE(S): JC06010Q; NC03162T

14/5/43 (Item 9 from file: 94)
DIALOG(R)File 94:JICST-EPlus

03565706 JICST ACCESSION NUMBER: 98A0456027 FILE SEGMENT: JICST-E
Oscillator **Networks for Image Segmentation and their Circuits using a PWM Method.**
ANDO HIROSHI (1); SAKABAYASHI SOTA (1); MORIE TAKASHI (1); NAGATA MAKOTO (1); IWATA ATSUSHI (1)
(1) Hiroshima Univ., Fac. of Eng.
Denshi Joho Tsushin Gakkai Gijutsu Kenkyu Hokoku(IEIC Technical Report (Institute of Electronics, Information and Communication Enginners), 1998, VOL.97,NO.624(NC97 139-177), PAGE.125-131, FIG.10, REF.8
JOURNAL NUMBER: S0532BBG
UNIVERSAL DECIMAL CLASSIFICATION: 681.3:165 681.3:007.52
LANGUAGE: Japanese COUNTRY OF PUBLICATION: Japan
DOCUMENT TYPE: Journal
ARTICLE TYPE: Original paper
MEDIA TYPE: Printed Publication
ABSTRACT: This paper describes a preliminary study for VLSI implementation of **oscillator** network model LEGION for image segmentation proposed by D.L. Wang, et al. Calculation precision needed for the proper operations is estimated to be 5bits by using software simulation. Since this model is described by differential equations with nonlinear functions, VLSI implementation using conventional neural network circuit architecture is difficult. A coupled **oscillator** circuit, which is the most important part of LEGION, is proposed by using a new pulse-width modulation(PWM) method. The basic operation of this proposed circuit is confirmed by circuit simulation. (author abst.)
DESCRIPTORS: image analysis; neural network; vibrator(device); **oscillation** phenomenon; nonlinear system; electronic circuit; VLSI; image processing; division and resolution; PAM(signal); computer simulation; semiconductor chip; **neurocomputer**
BROADER DESCRIPTORS: information processing; treatment;

analysis(separation); analysis; network; phenomenon; system; circuit; LSI; integrated circuit; micro circuit; pulse modulation; signal modulation; signal processing; computer application; utilization; simulation; solid state circuit parts; circuit component; parts; electric apparatus and parts; chip; computer; hardware
CLASSIFICATION CODE(S): JE07000S; JC06010Q

14/5/49 (Item 15 from file: 94)
DIALOG(R)File 94:JICST-EPlus

03128971 JICST ACCESSION NUMBER: 97A0073509 FILE SEGMENT: JICST-E
Basic research on neural network model for pulsed neuro device. (Ministry of Education S)
OKABE YOICHI (1); KITAGAWA MANABU (1); SHIBATA KATSUNARI (1)
(1) Univ. of Tokyo, RCAST Res. Center for Adv. Sci. and Technol.
Kyokugen Shusekika Shirikon Chino Erekutoronikusu. Heisei 7 Nendo(Ultimate Integration of Intelligence on Silicon Electronic Systems), 1996, PAGE.401-405, FIG.7
JOURNAL NUMBER: N19962938W
UNIVERSAL DECIMAL CLASSIFICATION: 681.3:007.52
LANGUAGE: Japanese COUNTRY OF PUBLICATION: Japan
DOCUMENT TYPE: Journal
ARTICLE TYPE: Original paper
MEDIA TYPE: Printed Publication
ABSTRACT: With the aim of realizing the intellectual function of the brain, a research was carried out on a vibrational amplitude learning by pulse information processing and moderationism learning by the neural network. This paper shows that in pulse newral network the network structure unique to the input pulse column is acquired by learning. This paper shows that moderationism learning is a more robust learning method compared to conventional direct current moderationism and adaptively acquires the stable **oscillation** in the network.
DESCRIPTORS: learning; **neurocomputer** ; pulse; pulse train; robustness; neural network model; synapse; neural network; information system; morphogenesis
BROADER DESCRIPTORS: computer; hardware; system characteristic; characteristic; biomodel; model; nerve tissue; animal tissue; biomedical tissue; organization; network; computer application system; system; developmental physiology
CLASSIFICATION CODE(S): JC06010Q

14/5/50 (Item 16 from file: 94)
DIALOG(R)File 94:JICST-EPlus

03128967 JICST ACCESSION NUMBER: 97A0073505 FILE SEGMENT: JICST-E
Dimension increasing and contraction of information using nonlinear dynamics. (Ministry of Education S)
YOSHIKAWA KEN'ICHI (1)
(1) Nagoya Univ., Grad. Sch.
Kyokugen Shusekika Shirikon Chino Erekutoronikusu. Heisei 7 Nendo(Ultimate Integration of Intelligence on Silicon Electronic Systems), 1996, PAGE.343-348, FIG.3, REF.13
JOURNAL NUMBER: N19962938W
UNIVERSAL DECIMAL CLASSIFICATION: 681.3:007.52
LANGUAGE: Japanese COUNTRY OF PUBLICATION: Japan
DOCUMENT TYPE: Journal
ARTICLE TYPE: Original paper
MEDIA TYPE: Printed Publication
ABSTRACT: By noticing dynamic nonlinear characteristics of the receptor (sensor) and the signal processing system (neural network), it was aimed to ultimately realize a new type of information processing sysem similar to an organism on a silicon substrate. Especially, results of the following two studies are reported: extraction of gaseous species

information by the semiconductor gas sensing system using the nonlinear characteristic and information processing using the multiple stability mode of the network (dynamic neural network) of the nonlinear **oscillator** .

DESCRIPTORS: neural network; nonlinearity; gas sensor; multistability; semiconductor chip; **neurocomputer** ; contraction(mathematics); vibrator(device); information system

BROADER DESCRIPTORS: network; property; gas detector; detector; sensor; instrumentation element; stability; solid state circuit parts; circuit component; parts; electric apparatus and parts; chip; computer; hardware; computer application system; system

CLASSIFICATION CODE(S): JC06010Q

14/5/51 (Item 17 from file: 94)

DIALOG(R)File 94:JICST-EPlus

03098529 JICST ACCESSION NUMBER: 97A0201067 FILE SEGMENT: JICST-E

On Coupled Oscillators **Networks for Cellular Neural Networks.**

MORO S (1); MORI S (1); NISHIO Y (2)
(1) Keio Univ. Yokohama-shi, JPN; (2) Tokushima Univ., Tokushima-shi, JPN

IEICE Trans Fundam Electron Commun Comput Sci(Inst Electron Inf Commun Eng), 1997, VOL.E80-A,NO.1, PAGE.214-222, FIG.14, TBL.3, REF.12
JOURNAL NUMBER: F0699CAT ISSN NO: 0916-8508
UNIVERSAL DECIMAL CLASSIFICATION: 681.3:007.52
LANGUAGE: English COUNTRY OF PUBLICATION: Japan
DOCUMENT TYPE: Journal
ARTICLE TYPE: Original paper
MEDIA TYPE: Printed Publication

ABSTRACT: When N **oscillators** are coupled by one resistor, we can see N-phase **oscillation** , because the system tends to minimize the current through the coupling resistor. Moreover, when the hard **oscillators** are coupled, we can see N, N-1, , 3, 2-phase **oscillation** and get much more phase states. In this study, the two types of coupled **oscillators** networks with third and fifth-power nonlinear characteristics are proposed. One network has two-dimensional hexagonal structure and the other has two-dimensional lattice structure. In the hexagonal circuit, adjacent three **oscillators** are coupled by one coupling resistor. On the other hand, in the lattice circuit, four **oscillators** are coupled by one coupling resistor. In this paper we confirm the phenomena seen in the proposed networks by circuit experiments and numerical calculations. In the system with third-power nonlinear characteristics, we can see the phase patterns based on 3-phase **oscillation** in the hexagonal circuit, and based on anti-phase **oscillation** in lattice circuit. In the system with fifth-power nonlinear characteristics, we can see the phase patterns based on 3-phase and anti-phase **oscillation** in both hexagonal and lattice circuits. In particular, in these networks, we can see not only the synchronization based on 3-phase and anti-phase **oscillation** ,but the synchronization which is not based on 3-phase and anti-phase **oscillation** . As a result, these networks are expected to generate various synchronization patterns. In these networks, each **oscillator** is connected to only its adjacent **oscillators** and various patterns are generated according to the initial condition. Therefore, we can consider that we can use these networks as a kind of cellular neural networks. (author abst.)

DESCRIPTORS: neural network model; **oscillator** (circuit); lattice-type circuit; **neurocomputer**

BROADER DESCRIPTORS: biomodel; model; signal generator; circuit; computer; hardware

CLASSIFICATION CODE(S): JC06010Q

14/5/55 (Item 21 from file: 94)

DIALOG(R)File 94:JICST-EPlus

02340326 JICST ACCESSION NUMBER: 94A0859096 FILE SEGMENT: JICST-E
Multilateral Research to Realize "BIODEVICE".
KISHIDA JUNNOSUKE (1)
(1) Asahi Shimbun Publ. Co.
Tekuno Karento(Techno Current), 1994, NO.139, PAGE.1(1),1-13, FIG.6
JOURNAL NUMBER: L1886AAI ISSN NO: 1341-0733
UNIVERSAL DECIMAL CLASSIFICATION: 001.89 681.3:001.89 57:001.89
681.3:007.52
LANGUAGE: English COUNTRY OF PUBLICATION: Japan
DOCUMENT TYPE: Journal
ARTICLE TYPE: Commentary
MEDIA TYPE: Printed Publication
DESCRIPTORS: biomodel; information processing; neural network model; organic semiconductor; learning model; nonlinear vibration; thin film; **neurocomputer**
BROADER DESCRIPTORS: model; treatment; semiconductor; organic conductor; conductor; object; **oscillation** ; membrane and film; computer; hardware
CLASSIFICATION CODE(S): AA03000V; JA01040I; EA01030S; JC06010Q

14/5/57 (Item 23 from file: 94)
DIALOG(R)File 94:JICST-EPlus

02247791 JICST ACCESSION NUMBER: 95A0059067 FILE SEGMENT: JICST-E
Performance Characteristics of Analog MOS Type Neuro-Processor.
INOUE YOSHIHIDE (1); TAGUCHI HIDEO (2); KURODA EIZO (3)
(1) Kobe Steel, Ltd., IP Center; (2) Teikyodai Riko; (3) Osaka Univ.
Denshi Joho Tsushin Gakkai Ronbunshi. D,2(Transactions of the Institute of Electronics, Information and Communication Engineers. D-2), 1994, VOL.77,NO.11, PAGE.2296-2305, FIG.13, TBL.6, REF.13
JOURNAL NUMBER: L0197AAM ISSN NO: 0915-1923
UNIVERSAL DECIMAL CLASSIFICATION: 681.3:007.52
LANGUAGE: Japanese COUNTRY OF PUBLICATION: Japan
DOCUMENT TYPE: Journal
ARTICLE TYPE: Original paper
MEDIA TYPE: Printed Publication
DESCRIPTORS: MOS integrated circuit; analog integrated circuit; **neurocomputer** ; neuron; control computer; circuit design; synapse; equivalent circuit; filtering; phase shift; **oscillator** (circuit)
BROADER DESCRIPTORS: semiconductor integrated circuit; integrated circuit; micro circuit; computer; hardware; nerve tissue; animal tissue; biomedical tissue; organization; special purpose computer; design; circuit; **signal** processing; treatment; **variation** ; **signal** generator
CLASSIFICATION CODE(S): JC06010Q

14/5/58 (Item 24 from file: 94)
DIALOG(R)File 94:JICST-EPlus

02073621 JICST ACCESSION NUMBER: 94A0429108 FILE SEGMENT: JICST-E
Special Issue on Neurocomputing. Stochastic Relaxation for Continuous Values. Standard Regularization Based on Gaussian MRF.
HONGO S (1); YOROIZAWA I (1)
(1) NTT Human Interface Lab., Yokosuka-shi, JPN
IEICE Trans Inf Syst(Inst Electron Inf Commun Eng), 1994, VOL.E77-D,NO.4, PAGE.425-432, FIG.16, REF.12
JOURNAL NUMBER: L1371AAJ ISSN NO: 0916-8532
UNIVERSAL DECIMAL CLASSIFICATION: 681.3:621.397.3
LANGUAGE: English COUNTRY OF PUBLICATION: Japan
DOCUMENT TYPE: Journal
ARTICLE TYPE: Original paper
MEDIA TYPE: Printed Publication
ABSTRACT: We propose a fast computation method of stochastic relaxation for

the continuous-valued Markov random field (MRF) whose energy function is represented in the quadratic form. In the case of regularization in visual information processing, the probability density function of a state transition can be transformed to a Gaussian function, therefore, the probablistic state transition is realized with Gaussian random numbers whose mean value and **variance** are calculated based on the condition of the input data and the neighborhood. Early visual information processing can be represented with a coupled MRF model which consists of continuity and discontinuity processes. Each of the continuity or discontinuity processes represents a visual property, which is like an intensity pattern, or a discontinuity of the continuity process. Since most of the energy function for early visual information processing can be represented by the quadratic form in the continuity process, the probability density of local computation variables in the continuity process is equivalent to the Gaussian function. If we use this characteristic, it is not necessary for the discrimination function computation to calculate the summation of the probabilities corresponding to all possible states, therefore, the computation load for the state transition is drastically decreased. Furthermore, if the continuous-valued discontinuity process is introduced, the MRF model can directly represent the strength of discontinuity. Moreover, the discrimination function of this energy function in the discontinuity process, which is linear, can also be calculated without probability summation. In this paper, a fast method for calculating the state transition probability for the continuous-valued MRF on the visual information processing is theoretically explained. (abridged author abst.)

DESCRIPTORS: **neurocomputer** ; fast algorithm; Markov process; normalization ; initial condition; computational complexity; image reproduction; relaxation method; **signal** estimation; Gaussian process; statistical estimation; discriminant function

BROADER DESCRIPTORS: computer; hardware; computer algorithm; algorithm; stochastic process; process; modification; condition; image processing; information processing; treatment; regeneration; successive approximation; approximation method; **signal** detection; detection; estimation; statistical decision; decision; statistical method; function(mathematics); mapping(mathematics

CLASSIFICATION CODE(S): JE04010I

14/5/60 (Item 26 from file: 94)

DIALOG(R)File 94:JICST-EPlus

02001046 JICST ACCESSION NUMBER: 94A0012347 FILE SEGMENT: JICST-E

Index distribution characteristics of functional thin film waveguide type optical neural devices.

MINAMOTO JUN'ICHI (1); MIYAZAKI YASUMITSU (1)
(1) Toyohashi Univ. of Technolgy

Denki Gakkai Denjikai Riron Kenkyukai Shiryo, 1993, VOL.EMT-93,NO.115-128, PAGE.27-34, FIG.8, REF.7
JOURNAL NUMBER: Z0909AAV
UNIVERSAL DECIMAL CLASSIFICATION: 681.7.068:535.3 535:681.7
LANGUAGE: Japanese COUNTRY OF PUBLICATION: Japan
DOCUMENT TYPE: Conference Proceeding
ARTICLE TYPE: Original paper
MEDIA TYPE: Printed Publication

ABSTRACT: In an optical neuro-element using a thin film waveguide, refractive index distribution which controls weighted production was analyzed. It is clarified that **differences** in refractive index of a thin film **wave** guide are depend on incident light **wave** features, which represent neurons, such as impulse or beam, and **frequencies** , and it is shown that in case of beamed incident light **waves** , **variation** of refractive index distribution is concentrated at central part of a **wave** guide. SN ratios for a **signal** light **interval** and input/output light **wave** intensity distributions were illustrated and explained.

DESCRIPTORS: optical waveguide; optical element; thin film optics; neuron; arithmetic unit; **neurocomputer** ; refractive index distribution; optical information processing
BROADER DESCRIPTORS: transmission line; waveguide; optical system; optics; physics; natural science; science; nerve tissue; animal tissue; biomedical tissue; organization; computer; hardware; distribution; information processing; treatment
CLASSIFICATION CODE(S): BD06030H; BD03060T

14/5/61 (Item 27 from file: 94)
DIALOG(R)File 94:JICST-EPlus

01661337 JICST ACCESSION NUMBER: 93A0048739 FILE SEGMENT: JICST-E
Identification of the Nonlinearity of Robot Manipulators by a Neural Network.
OSAKA KAZUMASA (1); MAEDA TERUYA (1); ONO TOSHIRO (2)
(1) Okayama Univ. of Science; (2) Univ. of Osaka Prefecture
Nippon Kikai Gakkai Ronbunshu. C(Transactions of the Japan Society of Mechanical Engineers. C), 1992, VOL.58,NO.555, PAGE.3233-3237, FIG.11, TBL.3, REF.6
JOURNAL NUMBER: F0045BAL ISSN NO: 0387-5024
UNIVERSAL DECIMAL CLASSIFICATION: 007.52:681.51
LANGUAGE: Japanese COUNTRY OF PUBLICATION: Japan
DOCUMENT TYPE: Journal
ARTICLE TYPE: Original paper
MEDIA TYPE: Printed Publication
ABSTRACT: In order to ensure the high-speed and high-precision control of trajectory tracking for robot manipulators, it is necessary to construct a precise dynamic model by which the manipulator is controlled. In the motion equation of the manipulator, the driving force is a very important term from the standpoint of control. We assume the nonlinearities of the manipulator and driving system are expressed as nonlinear functions between the driving force and the control input of the driving motors. This paper proposes an identification method for the nonlinearities of a robot manipulator by means of a neural network. It was experimentally confirmed that the proposed method is effective in the case of trajectory tracking control for a 2-link manipulator. (author abst.)
DESCRIPTORS: manipulator; neural network; **neurocomputer** ; system identification; nonlinear vibration; linkage(machine element); control system(computer); positioning
BROADER DESCRIPTORS: robot; network; computer; hardware; identification; recognition; **oscillation** ; motion mechanism; mechanism of machine element; mechanism; method
CLASSIFICATION CODE(S): IC04012J

14/5/62 (Item 28 from file: 94)
DIALOG(R)File 94:JICST-EPlus

01633090 JICST ACCESSION NUMBER: 92A0702256 FILE SEGMENT: JICST-E
A Harmonic Retrieval Algorithm with Neural Computation.
ZHOU M (1); OKAMOTO J (1); YAMASHITA K (1)
(1) Osaka City Univ., Osaka-shi, JPN
IEICE Trans Inf Syst(Inst Electron Inf Commun Eng), 1992, VOL.E75-D,NO.5, PAGE.718-727, FIG.5, TBL.4, REF.15
JOURNAL NUMBER: L1371AAJ ISSN NO: 0916-8532
UNIVERSAL DECIMAL CLASSIFICATION: 621.391.3 681.3:007.52
LANGUAGE: English COUNTRY OF PUBLICATION: Japan
DOCUMENT TYPE: Journal
ARTICLE TYPE: Original paper
MEDIA TYPE: Printed Publication
ABSTRACT: A novel harmonic retrieval algorithm is proposed in this paper based on Hopfield's neural network. **Frequencies** can be retrieved with

high accuracy and high resolution under low **signal** to noise ratio(SNR). Amplitudes and phases in harmonic **signals** can also be estimated roughly by an energy constrained linear projection approach as proposed in the algorithm. Only no less than 2q neurons are necessary in order to detect harmonic **signals** with q **different frequencies** , where q denotes the number of **different frequencies** in harmonic **signals** . Experimental simulations show fast convergence and stable solution in spite of low **signal** to noise ratio can be obtained using the proposed algorithm. (author abst.)
DESCRIPTORS: Hopfield model; **neurocomputer** ; SN ratio; optimization problem; projection(mathematics); resolving power; higher harmonic; parameter estimation; pattern recognition; **signal** detection
BROADER DESCRIPTORS: neural network model; biomodel; model; computer; hardware; noise characteristic; characteristic; ratio; problem; performance; **wave** motion; system identification; identification; recognition; statistical estimation; estimation; statistical decision; decision; statistical method; detection
CLASSIFICATION CODE(S): ND02020G; JC06010Q

14/5/64 (Item 30 from file: 94)
DIALOG(R)File 94:JICST-EPlus

00804178 JICST ACCESSION NUMBER: 89A0008467 FILE SEGMENT: JICST-E
Neurocomputer **and its application to robot control.**
NAGATA SHIGEMI (1); SEKIGUCHI MINORU (1); YOSHIZAWA HIDEKI (1); WATANABE NOBUO (1); KIMOTO TAKASHI (1); ASAKAWA KAZUO (1)
(1) Fujitsu Labs. Ltd.
Joho Shori Gakkai Kenkyu Hokoku, 1988, VOL.88,NO.85(FI-11), PAGE.11.2.1-11.2.8, FIG.8, TBL.1, REF.10
JOURNAL NUMBER: Z0031BAO ISSN NO: 0919-6072
UNIVERSAL DECIMAL CLASSIFICATION: 612.8:007 007.52
LANGUAGE: Japanese COUNTRY OF PUBLICATION: Japan
DOCUMENT TYPE: Journal
ARTICLE TYPE: Original paper
MEDIA TYPE: Printed Publication
ABSTRACT: A structured network model for robot control and its learning algorithm are presented. The model is divided into two sub-networks connected each other with a short term memory to process time dependent data. We have developed the learning algorithm, pseudoimpedance control, which has damped **oscillation** characteristic to avoid the local minimum problem. To evaluate the network model and the learning algorithm, small mobile robots controlled by neural networks have been developed. They were taught variety of habits to play a cops-and-robbers game. Through training, the robots learned habits such as capture and escape.(author abst.)
DESCRIPTORS: neural network; robot; computing control; brain; network structure; hierarchical structure; learning; system model; sensor; mobile robot; **neurocomputer** ; neuron
BROADER DESCRIPTORS: network; computer application; utilization; automatic control; control; central nervous system; nervous system; structure; model; instrumentation element; computer; hardware; nerve tissue; animal tissue; biomedical tissue; organization
CLASSIFICATION CODE(S): EL02050C; IC04010B

14/5/66 (Item 2 from file: 95)
DIALOG(R)File 95:TEME-Technology & Management

01094312 E97056082245
Sensor data compression for smart mechanical systems by artificial neural networks
(Datenkompression an intelligenten Strukturen mittels kuenstlicher neuronaler Netze)
Lilienblum, T; Weihua Zhang; Michaelis, B

Otto-von-Guericke-Univ. Magdeburg, D
Smart Mechanical Systems - Adaptronics. Proc of the Second Scientific Conf., Preprint Nr. 2, Otto-von-Guericke-Univ. Magdeburg, 18th - 19th March 19971997
Document type: Conference paper Language: English
Record type: Abstract

ABSTRACT:
Zur stabilisierenden Wirkung der auf 'intelligente' mechanische Systeme einwirkenden Kraftbelastungen und Schwingungen werden erfolgreich sensorische Systeme in diese Bauelemente integriert. Notwendig ist allerdings der gleichzeigtige Einsatz zahlreicher sensorischer Aktoren und ihre zu Regelungsbefehlen fuehrenden Abtastsignale. In Verbindung mit zahlreichen Prinzipskizzen und formelmaessigen mathematischen Erlaeuterungen wird dargelegt, dass mit einem modifizierten assoziativen Speicher zur 3-D-Bildverarbeitung, die Kompression der Sensordaten eines solchen mechanischen Systems moeglich ist. Die Sensordaten werden in Form von Neuron in eine erste Schicht eingespeist. In der zweiten Schicht geschieht dann die erwuenschte Datenkompression. Die Daten werden dann als a-priori-Kennwerte (Wichtung) in einem Neural-Netzwerk gespeichert. Die Berechnungsdauer laesst sich durch den Einsatz eines **Neuro - Computers** reduzieren. Die Zweckmaessigkeit dieses Datenkompressionsverfahrens konnte durch Simulation nachgewiesen werden.

DESCRIPTORS: ARTIFICIAL NEURAL NETWORKS; DATA COMPRESSION; ADAPTIVE SYSTEM; **OSCILLATION** ATTENUATION
IDENTIFIERS: AKTIVE DAEMPFUNG; ADAPTRONIK; intelligente Struktur; Datenkompression

Set	Items	Description
S1	689	NEURO()COMPUTER? OR NEUROCOMPUTER?
S2	30939	OSCILLAT?
S3	294512	RHYTHMIC? OR METRICAL OR MEASURED OR CADENCED
S4	8635064	FREQUENCY OR FREQUENCIES OR SIGNAL? OR WAVE? ? OR PULSE? ? OR WAVEFORM? ? OR TIME OR PERIODICALLY OR INTERVAL? OR DURATI-ON
S5	2922975	DIFFERENCE? ? OR VARIANCE? ? OR VARIATION OR DIVERGENCE OR DEVIATION OR DIFFERENT
S6	0	S1 (S) S2 (S) S3
S7	5	S1 (S) S2
S8	2	S1 (S) S3
S9	113	S1 (S) S4
S10	6	S9 (S) S5
S11	12	S7 OR S8 OR S10
S12	12	S11 NOT PY>1999
S13	12	S12 NOT PD>19991112
S14	11	RD (unique items)

File 15:ABI/Inform(R) 1971-2004/Oct 26
(c) 2004 ProQuest Info&Learning
File 810:Business Wire 1986-1999/Feb 28
(c) 1999 Business Wire
File 647:CMP Computer Fulltext 1988-2004/Oct W3
(c) 2004 CMP Media, LLC
File 275:Gale Group Computer DB(TM) 1983-2004/Oct 27
(c) 2004 The Gale Group
File 674:Computer News Fulltext 1989-2004/Sep W1
(c) 2004 IDG Communications
File 696:DIALOG Telecom. Newsletters 1995-2004/Oct 26
(c) 2004 The Dialog Corp.
File 621:Gale Group New Prod.Annou.(R) 1985-2004/Oct 27
(c) 2004 The Gale Group
File 636:Gale Group Newsletter DB(TM) 1987-2004/Oct 27
(c) 2004 The Gale Group
File 813:PR Newswire 1987-1999/Apr 30
(c) 1999 PR Newswire Association Inc
File 613:PR Newswire 1999-2004/Oct 26
(c) 2004 PR Newswire Association Inc
File 16:Gale Group PROMT(R) 1990-2004/Oct 27
(c) 2004 The Gale Group
File 160:Gale Group PROMT(R) 1972-1989
(c) 1999 The Gale Group
File 553:Wilson Bus. Abs. FullText 1982-2004/Sep
(c) 2004 The HW Wilson Co

14/5,K/1 (Item 1 from file: 647)
DIALOG(R)File 647:CMP Computer Fulltext

00559982 CMP ACCESSION NUMBER: EET19900129S3553
Attentional neurocomputing deserves more attention
ROBERT HECHT-NIELSEN
ELECTRONIC ENGINEERING TIMES, 1990, n 575, T28
PUBLICATION DATE: 900129
JOURNAL CODE: EET LANGUAGE: English
RECORD TYPE: Fulltext
SECTION HEADING: SR
WORD COUNT: 1305
TEXT:
CHAIRMAN HNC INC.

... tools and human/machine interfaces.
The Grey and Singer work may also lead to new approaches to **neurocomputer** hardware design-for example, neural chips consisting of large pools of analog phase-locked loop **oscillators** that interact dynamically with incoming data, central rhythm generators and each other. Attentional **neurocomputers** may be better able to exploit the natural strengths of analog VLSI technology (e.g., the implementation of dynamic system elements, such as **oscillators**) than current neurocomputing design approaches, which mainly use analog circuits to carry out arithmetic operations-functions that...

14/5,K/3 (Item 2 from file: 275)
DIALOG(R)File 275:Gale Group Computer DB(TM)

01447521 SUPPLIER NUMBER: 11285855 (USE FORMAT 7 OR 9 FOR FULL TEXT)
Chaotic neurocomputer developed.
Miyazawa, Masayuki
Newsbytes, NEW09160022
Sept 16, 1991
LANGUAGE: ENGLISH RECORD TYPE: FULLTEXT
WORD COUNT: 242 LINE COUNT: 00018

DESCRIPTORS: Oscillators; Patent; Research and Development; New Technique ; Artificial Intelligence
FILE SEGMENT: NW File 649

TEXT:
CHAOTIC **NEUROCOMPUTER** DEVELOPED 09/16/91 TOKYO, JAPAN, 1991 SEP 16 (NB) -- Professor Masayoshi Inoue of Kagashima University has developed a new concept in the area of neurocomputing. He uses what's called a Chaos **Oscillator** which employs the Chaos concept of order within disorder.
Professor Inoue's **neurocomputer** , equipped with the "Chaos **Oscillator** ," is said to be able to recognize a variety of vague patterns and, he contends, is much closer in operation and reasoning to the human brain. The Chaos **Oscillator** is based on the mathematical formula "AX(1-X)." The numbers 0 through 1 are input as...

14/5,K/4 (Item 3 from file: 275)
DIALOG(R)File 275:Gale Group Computer DB(TM)

01300618 SUPPLIER NUMBER: 07361680 (USE FORMAT 7 OR 9 FOR FULL TEXT)
New technology learns Wall Street's mindset. (artificial intelligence)
Chithelen, Ignatius
Wall Street Computer Review, v6, n9, p19(4)
June, 1989
ISSN: 0738-4343 LANGUAGE: ENGLISH RECORD TYPE: FULLTEXT; ABSTRACT
WORD COUNT: 2161 LINE COUNT: 00171

ABSTRACT: More than 200 firms, including start-ups and such giants as IBM and DEC, are researching neurocomputing. A neural network is a computing architecture based on the way the brain is believed to draw upon experience to infer ways of recognizing similarities and ignoring **differences** among like patterns. One of the advantages of **neurocomputers** is that they reduce the cost and **time** of software development. In an expert system, a human expert must write an algorithm - a step-by-step procedure - that tells the computer how to perform a desired task. In contrast, a **neurocomputer** comes up with an algorithm of its own. There is a wide consensus that neurocomputing is in its infancy and will not duplicate the functioning of the human brain for a very long **time** , if ever.
CAPTIONS: An application that predicts the Standard & Poor's 500 index. (graph)
SPECIAL FEATURES: illustration; graph
COMPANY NAMES: Hecht-Nielsen Neurocomputer Corp.--Innovations; Nestor Inc.--Contracts
DESCRIPTORS: Artificial Intelligence; Wall Street; Neural Network; Forecasting; Brokerage Industry; Cooperative Agreements; Computer Design; Expert Systems; Algorithm Complexity; Cost of Programming; Future of Computing
SIC CODES: 7372 Prepackaged software
TRADE NAMES: NeuralWorks Professional (Expert system development software)--Usage
FILE SEGMENT: CD File 275

...ABSTRACT: way the brain is believed to draw upon experience to infer ways of recognizing similarities and ignoring **differences** among like patterns. One of the advantages of **neurocomputers** is that they reduce the cost and **time** of software development. In an expert system, a human expert must write an algorithm - a step-by-step procedure - that tells the computer how to perform a desired task. In contrast, a **neurocomputer** comes up with an algorithm of its own. There is a wide consensus that neurocomputing is in its infancy and will not duplicate the functioning of the human brain for a very long **time** , if ever.

14/5,K/5 (Item 4 from file: 275)
DIALOG(R)File 275:Gale Group Computer DB(TM)

01249762 SUPPLIER NUMBER: 06740187 (USE FORMAT 7 OR 9 FOR FULL TEXT)
Object recognition opens the eyes of machine-vision systems.
Williams, Tom
Computer Design, v27, n9, p69(10)
May 1, 1988
ISSN: 0010-4566 LANGUAGE: ENGLISH RECORD TYPE: FULLTEXT; ABSTRACT
WORD COUNT: 4236 LINE COUNT: 00331

ABSTRACT: Automatic object recognition demands high computing power because the process is not a linear one easily defined by algorithms, global image association is required, and all received data needs to be simultaneously processed. Object recognition system vendors, though, are using new architectures and image-processing techniques to maximize the throughput and accuracy in image capture, image conditioning for recognition, extraction of relevant image data, and decision on image content. Evolving feature extraction systems include true gray-scale processing, edge and corner identification, and pattern matching. Modular systems provide adaptability to specific recognition applications. Neural networks offer great promise for fast object recognition, as the architecture is oriented to the global processing and resolution required. Various products are described.
CAPTIONS: Diagram of Hecht-Nielsen Neurocomputers' face recognizer. (chart)

SPECIAL FEATURES: illustration; photograph; chart
DESCRIPTORS: Image Processing; Object Recognition; Trends; New Technique;

.Products; Functional Capabilities; Neural Network
SIC CODES: 3571 Electronic computers; 3577 Computer peripheral equipment, not elsewhere classified
FILE SEGMENT: CD File 275

... addresses, processing routines and lookup tables.
One neural-network system is tthe Anza Plus from Hecht-Nielsen **Neurocomputers** (San Diego, CA). Anza Plus is an aT-compatible board that contains a reduced-instruction-set-type...

...fast enough to seem connected in real time. The processing rate of such a neural network is **measured** in interconnects per second (IPS), and the Anza Plus has a sustained rate of 6 million IPS...

14/5,K/6 (Item 1 from file: 636)
DIALOG(R)File 636:Gale Group Newsletter DB(TM)

01583039 Supplier Number: 42368190 (THIS IS THE FULLTEXT)
CHAOTIC NEUROCOMPUTER DEVELOPED 09/16/91
Newsbytes, pN/A
Sept 16, 1991
Language: English Record Type: Fulltext
Document Type: Newswire; General Trade
Word Count: 226
TEXT:
TOKYO, JAPAN, 1991 SEP 16 (NB) -- Professor Masayoshi Inoue of Kagashima University has developed a new concept in the area of neurocomputing. He uses what's called a Chaos Oscillator which employs the Chaos concept of order within disorder.

Professor Inoue's **neurocomputer** , equipped with the "Chaos **Oscillator** ," is said to be able to recognize a variety of vague patterns and, he contends, is much closer in operation and reasoning to the human brain. The Chaos **Oscillator** is based on the mathematical formula "AX(1-X)." The numbers 0 through 1 are input as "X." Professor Inoue's model continuously compares two formulas to reach a conclusion, which is different from traditional, Von-Neuman-type computers, which deal with only 1 and 0.

Under Prof. Inoue's system, it is said more complicated patterns can be processed. Currently, Prof. Inoue is running the system with software, but he wants to incorporate the features onto a computer chip. The chip could play an important role in the development of programs based on advanced artificial intelligence.

It is said Prof. Inoue has already applied for copyright in Japan, and is planning to apply for the same in the U.S. and the U.K. soon. Details of the study are expected to be introduced in the "Physics Letters A" of the Physics International Research in Europe by the end of this month.

(Masayuki Miyazawa/19910916)

PUBLISHER NAME: Newsbytes News Network
EVENT NAMES: *310 (Science & research)
GEOGRAPHIC NAMES: *9JAPA (Japan)
PRODUCT NAMES: *3573100 (Computers)
INDUSTRY NAMES: BUSN (Any type of business); CMPT (Computers and Office Automation); TELC (Telecommunications)
NAICS CODES: 334111 (Electronic Computer Manufacturing)

Professor Inoue's **neurocomputer** , equipped with the "Chaos **Oscillator** ," is said to be able to recognize a variety of vague patterns and, he contends, is much closer in operation and reasoning to the human brain. The Chaos **Oscillator** is based on the mathematical formula "AX(1-X)." The numbers 0 through 1 are input as...

14/5,K/7 (Item 2 from file: 636)

from Silicon Graphics. The system, to be installed for testing in an F-18 and a CH-53, will give pilots real- **time** solid color graphics for mission presentations....Unisys, McLean, Va., is part of a team chosen by NASA to provide hardware, software and systems integration for the space station Freedom control center. Unisys will support prime contractor Ford Aerospace....Database management software from Informix will be included in three projects awarded recently by the Navy. They are the Desktop Tactical Computer awarded to systems integrator C3 Inc., the Tomahawk Planning System awarded to McDonnell Douglas and Loral, and the Metrology Automated Support for Recall and reporting (MEASURE), won by Honeywell.

PUBLISHER NAME: Pasha Publications, Inc.
INDUSTRY NAMES: AERO (Aerospace and Defense); BUSN (Any type of business); CMPT (Computers and Office Automation)

(USE FORMAT 7 FOR FULLTEXT)
TEXT:
...Defense Data Network. In the environment of packet-switching communication, Blacker permits controlled access to information at **different** security levels based on the user's need to know....The Defense Advanced Research Projects Agency has given Hecht-Nielson **Neuro - computers** , San Diego, a $250,000 contract for the second phase of development for the next-generation VLSI...

...to be installed for testing in an F-18 and a CH-53, will give pilots real- **time** solid color graphics for mission presentations....Unisys, McLean, Va., is part of a team chosen by NASA...

14/5,K/8 (Item 1 from file: 16)
DIALOG(R)File 16:Gale Group PROMT(R)

01745216 Supplier Number: 42185189
Whisky Aromatic Molecules Discrimination System
New Technology Japan, p40
July, 1991
ISSN: 0385-6542
Language: English Record Type: Abstract
Document Type: Magazine/Journal; Trade

ABSTRACT:
Suntory and researchers from the Tokyo Inst of Technology have developed an automated quality control system for whisky, with equipment that can distinguish as many as 5 **different** brands. The aromatic molecule discrimination system, scheduled for commercial introduction by end-FY91, contains a heated air feeding unit that delivers samples to 8 sensors containing 8 types of membranes, including lipid, cholesterol, and cellulose, and quartz **oscillators** . The **signals** from the sensors are sent to a **neurocomputer** , which studies the output for 10,000 cycles, and having learned the patterns, can discern aromas of up to 5 brands of whiskey, comparable or superior to human performance. The Ministry of Education subsidized the 2-yr R&D project.
PUBLISHER NAME: Japan External Trade Organization
COMPANY NAMES: *Suntory Ltd.
EVENT NAMES: *330 (Product information)
GEOGRAPHIC NAMES: *9JAPA (Japan)
PRODUCT NAMES: *3551462 (Beverage Quality Control Equipment); 3573034 (Computerized Inspection Systems)
INDUSTRY NAMES: BUSN (Any type of business); CHEM (Chemicals, Plastics and Rubber); INTL (Business, International); METL (Metals, Metalworking and Machinery)
NAICS CODES: 333993 (Packaging Machinery Manufacturing); 334111 (Electronic Computer Manufacturing)
SPECIAL FEATURES: COMPANY

ABSTRACT:
...developed an automated quality control system for whisky, with equipment that can distinguish as many as 5 **different** brands. The aromatic molecule discrimination system, scheduled for commercial introduction by end-FY91, contains a heated air...

...delivers samples to 8 sensors containing 8 types of membranes, including lipid, cholesterol, and cellulose, and quartz **oscillators** . The **signals** from the sensors are sent to a **neurocomputer** , which studies the output for 10,000 cycles, and having learned the patterns, can discern aromas of ...

14/5,K/9 (Item 1 from file: 160)
DIALOG(R)File 160:Gale Group PROMT(R)

02084786
AISTs Electrotechnical Laboratory Develops Image Recognition System
Comline Computers December 7, 1988 p. 1

An information science R&D group at the Agency of Industrial Science and Technology's (AIST) Electrotechnical Laboratory has developed an image recognition system which can learn to recognize its target images in one tenth the **time** of existing **neuro - computer** systems. The system employs multivariate analysis instead of a neuro-network system, and includes a video camera, application specific ICs (ASICs), and a personal computer. The system recognizes an image input from the camera by comparing the image against a series of 25 optical mask patterns and analyzing the results, and on a test using 2,000 samples of 37 **different** characters the system achieved 98.7% accuracy.

The system can be constructed with off-the-shelf LSIs, and does not require special devices, such as the optical elements used in neuro-computer systems, making the system more commercially viable.

COMLINE NEWS SERVICE, Sugetsu Building, 3-12-7 Kita-Aoyama, Minato-Ku, Tokyo 107, Japan. Telex 2428134 COMLN J.
PRODUCT: *Image Analysis Equip (3662653)
EVENT: *Product Design & Development (33)
COUNTRY: *Japan (9JPN)

... developed an image recognition system which can learn to recognize its target images in one tenth the **time** of existing **neuro - computer** systems. The system employs multivariate analysis instead of a neuro-network system, and includes a video camera...

... optical mask patterns and analyzing the results, and on a test using 2,000 samples of 37 **different** characters the system achieved 98.7% accuracy.

The system can be constructed with off-the-shelf LSIs...

14/5,K/10 (Item 2 from file: 160)
DIALOG(R)File 160:Gale Group PROMT(R)

01825783
HNC RELEASES ADVANCED NEURAL NETWORKS FOR SELF-PROGRAMMING IMAGE RECOGNITION SYSTEMS
News Release October 30, 1987 p. 1

Hecht-Nielsen **Neurocomputer** Corp. (HNC) introduces AR/NET, the first fully-functional version of the Adaptive Resonance Network, a neural network architecture that is especially adept at the unsupervised recognition and classification of arbitrary patterns. In combination with the HNC ANZA Neurocomputing Coprocessor System (which can be installed in

```
Set     Items   Description
S1          3   AU='HOPPENSTEADT F C' OR AU='HOPPENSTEADT FRANK C'
S2          5   AU='IZHIKEVICH': AU='IZHIKEVICH EUGENE'
S3          5   S1 OR S2
S4          5   S3 AND IC=(G06E? OR G06F? OR G06G?)
File 347:JAPIO Nov 1976-2004/Jun(Updated 041004)
         (c) 2004 JPO & JAPIO
File 348:EUROPEAN PATENTS 1978-2004/Oct W03
         (c) 2004 European Patent Office
File 349:PCT FULLTEXT 1979-2002/UB=20041021,UT=20041014
         (c) 2004 WIPO/Univentio
File 350:Derwent WPIX 1963-2004/UD,UM &UP=200467
         (c) 2004  Thomson Derwent
```

4/5/2 (Item 2 from file: 348)
DIALOG(R)File 348:EUROPEAN PATENTS

01171018
OSCILLATARY NEUROCOMPUTERS WITH DYNAMIC CONNECTIVITY
ORDINATEUR NEUROMIMETIQUE OSCILLATOIRE A CONNECTIVITE DYNAMIQUE
PATENT ASSIGNEE:
  Arizona Board Of Regents, a Body corporate acting on behalf of Arizona State University, (2713360), Bank One Building, Suite 201, 20 E. Iniversity,, Tempe, AZ 85282, (US), (Applicant designated States: all)
INVENTOR:
  HOPPENSTEADT, Frank, C. , 4864 E. Caida Del Sol, Paradise Valley, AZ 85253, (US)
  IZHIKEVICH , Eugene, 2700 N. Hayden Road 2036, Scottsdale, AZ 85257, (US
PATENT (CC, No, Kind, Date):
WO 200029970 000525
APPLICATION (CC, No, Date): EP 99960287 991112; WO 99US26698 991112
PRIORITY (CC, No, Date): US 108353 P 981113
DESIGNATED STATES: AT; BE; CH; CY; DE; DK; ES; FI; FR; GB; GR; IE; IT; LI; LU; MC; NL; PT; SE
INTERNATIONAL PATENT CLASS: **G06F-015/18 ; G06F-015/80**
LEGAL STATUS (Type, Pub Date, Kind, Text):

Application:	000719	A1	International application. (Art. 158(1))
Application:	000719	A1	International application entering European phase
Application:	020612	A1	International application. (Art. 158(1))
Appl Changed:	020612	A1	International application not entering European phase
Withdrawal:	020612	A1	Date application deemed withdrawn: 20010614

LANGUAGE (Publication,Procedural,Application): English; English; English

4/5/4 (Item 2 from file: 349)
DIALOG(R)File 349:PCT FULLTEXT

00566597 **Image available**
OSCILLATARY NEUROCOMPUTERS WITH DYNAMIC CONNECTIVITY
ORDINATEUR NEUROMIMETIQUE OSCILLATOIRE A CONNECTIVITE DYNAMIQUE
Patent Applicant/Assignee:
  ARIZONA BOARD OF REGENTS a body corporate acting;on behalf of ARIZONA STATE UNIVERSITY,
  HOPPENSTEADT Frank C,
  IZHIKEVICH Eugene,
Inventor(s):
  HOPPENSTEADT Frank C ,
  IZHIKEVICH Eugene
Patent and Priority Information (Country, Number, Date):
  Patent: WO 200029970 A1 20000525 (WO 0029970)
  Application: WO 99US26698 19991112 (PCT/WO US9926698)
  Priority Application: US 98108353 19981113
Designated States:
(Protection type is "patent" unless otherwise stated - for applications prior to 2004)
  CN JP KR US AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE
Main International Patent Class: **G06F-015/18**
International Patent Class: **G06F-015/80**
Publication Language: English
Fulltext Availability:
  Detailed Description
  Claims
Fulltext Word Count: 5178

English Abstract
A neurocomputer (50) comprises n oscillating processing elements (60A,

60B, 60C, 60D and 60E) that communicate through a common medium (70) so that there are required only n connective junctions (80A, 80B, 80C, 80D and 80E). A rhythmic external forcing input (90) modulates the oscillatory frequency of the medium (70) which, in turn, is imparted to the n oscillators (60A, 60B, 60C, 60D and 60E). Any two oscillators oscillating at different frequencies may communicate provided that input's power spectrum includes the frequency equal to the difference between the frequencies of the two oscillators in question. Thus, selective communication, or dynamic connectivity, between different neurocomputer oscillators occurs due to the frequency modulation of the medium (70) by external forcing.

French Abstract
Cet ordinateur neuromimetique (50) comprend n elements de traitement oscillants (60A, 60B, 60C, 60D et 60E) qui communiquent par l'intermediaire d'un support commun (70) de sorte que seulement n jonctions de connexion (80A, 80B, 80C, 80D et 80E) sont necessaires. L'entree d'une contrainte, exterieure, rythmique (90) module la frequence oscillatoire du support (70), laquelle est a son tour appliquee aux n oscillateurs (60A, 60B, 60C, 60D et 60E). Deux oscillateurs quelconques, oscillant a des frequences differentes, peuvent communiquer pourvu que le spectre de la puissance d'entree comprenne la frequence egale a la difference entre les frequences des deux oscillateurs en question. Ainsi, il se produit une communication selective, ou une connectivite dynamique, entre differents oscillateurs de l'ordinateur neuromimetique, par suite de la modulation de frequence du support (70) au moyen d'une contrainte exterieure.

4/5/5 (Item 1 from file: 350)
DIALOG(R)File 350:Derwent WPIX

013216035 **Image available**
WPI Acc No: 2000-387909/200033
XRPX Acc No: N00-290353

Oscillatory neuro-computer for simulating oscillatory nature of brain neurons, has conductive medium coupled to connectors, which applies oscillatory signal to each oscillator via corresponding connector

Patent Assignee: UNIV ARIZONA STATE (UYAR-N)
Inventor: **HOPPENSTEADT F C ; IZHIKEVICH E**
Number of Countries: 022 Number of Patents: 001
Patent Family:

Patent No	Kind	Date	Applicat No	Kind	Date	Week	
WO 200029970	A1	20000525	WO 99US26698	A	19991112	200033	B

Priority Applications (No Type Date): US 98108353 P 19981113
Patent Details:

Patent No	Kind	Lan	Pg	Main IPC	Filing Notes
WO 200029970	A1	E	38	G06F-015/18	

Designated States (National): CN JP KR US
Designated States (Regional): AT BE CH CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE

Abstract (Basic): WO 200029970 A1

NOVELTY - Several connectors (80A-80E) are operably coupled with corresponding oscillators (60A-60E). A conductive medium (70) is operably coupled to the connectors, simultaneously applies oscillatory signal to each oscillator via the connector. A sourcing apparatus with rhythmic external forcing input (90) generating an oscillatory signal, is operably coupled with the medium.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for communication establishing method between two oscillator having different frequencies.

USE - For simulating oscillatory nature of brain neurons.

ADVANTAGE - Neuro-computer can act as a classical fully connected Hopfield network even when there are only interconnections.

DESCRIPTION OF DRAWING(S) - The figure shows the schematic diagram

of neural network having five neural processing elements.

Oscillators (60A-60E)

Conductive medium (70)

Connectors (80A-80E)

pp; 38 DwgNo 2/13

Title Terms: OSCILLATING; NEURO; COMPUTER; SIMULATE; OSCILLATING; NATURE; BRAIN; NEURON; CONDUCTING; MEDIUM; COUPLE; CONNECT; APPLY; OSCILLATING; SIGNAL; OSCILLATOR; CORRESPOND; CONNECT

Derwent Class: T01; T02; U23

International Patent Class (Main): **G06F-015/18**

International Patent Class (Additional): **G06F-015/80**

File Segment: EPI

```
Set     Items   Description
S1        335   AU=(HOPPENSTEADT, F? OR HOPPENSTEADT F? OR IZHIKEVICH E? OR
              IZHIKEVICH E?)
File   2:INSPEC 1969-2004/Oct W3
         (c) 2004 Institution of Electrical Engineers
File   6:NTIS 1964-2004/Oct W2
         (c) 2004 NTIS, Intl Cpyrght All Rights Res
File   8:Ei Compendex(R) 1970-2004/Oct W3
         (c) 2004 Elsevier Eng.  Info. Inc.
File  34:SciSearch(R) Cited Ref Sci 1990-2004/Oct W3
         (c) 2004 Inst for Sci Info
File  35:Dissertation Abs Online 1861-2004/Sep
         (c) 2004 ProQuest Info&Learning
File  65:Inside Conferences 1993-2004/Oct W4
         (c) 2004 BLDSC all rts. reserv.
File  92:IHS Intl.Stds.& Specs. 1999/Nov
         (c) 1999 Information Handling Services
File  94:JICST-EPlus 1985-2004/Sep W4
         (c)2004 Japan Science and Tech Corp(JST)
File  95:TEME-Technology & Management 1989-2004/Jun W1
         (c) 2004 FIZ TECHNIK
File  99:Wilson Appl. Sci & Tech Abs 1983-2004/Sep
         (c) 2004 The HW Wilson Co.
File 103:Energy SciTec 1974-2004/Oct B1
         (c) 2004 Contains copyrighted material
File 144:Pascal 1973-2004/Oct W3
         (c) 2004 INIST/CNRS
File 202:Info. Sci. & Tech. Abs. 1966-2004/Sep 09
         (c) 2004 EBSCO Publishing
File 233:Internet & Personal Comp. Abs. 1981-2003/Sep
         (c) 2003 EBSCO Pub.
File 239:Mathsci 1940-2004/Dec
         (c) 2004 American Mathematical Society
File 275:Gale Group Computer DB(TM) 1983-2004/Oct 26
         (c) 2004 The Gale Group
File 434:SciSearch(R) Cited Ref Sci 1974-1989/Dec
         (c) 1998 Inst for Sci Info
File 647:CMP  Computer Fulltext 1988-2004/Oct W3
         (c) 2004 CMP Media, LLC
File 674:Computer News Fulltext 1989-2004/Sep W1
         (c) 2004 IDG Communications
File 696:DIALOG Telecom. Newsletters 1995-2004/Oct 26
         (c) 2004 The Dialog Corp.
```

1/5/1 (Item 1 from file: 2)
DIALOG(R)File 2:INSPEC

7962207 INSPEC Abstract Number: B2004-06-0170C-021, C2004-06-3355-012
Title: Diffusion bay simulation and its impact on the overall FAB performance: a simplified example
Author(s): Collins, D.W.; Flores-Godoy, J.-J.; Tsakalis, K.S.; **Hoppensteadt, F.C.**
Author Affiliation: Arizona State Univ., Mesa, AZ, USA
Conference Title: 2003 IEEE International Symposium on Semiconductor Manufacturing. Conference Proceedings (Cat. No.03CH37462) p.315-18
Publisher: IEEE, Piscataway, NJ, USA
Publication Date: 2003 Country of Publication: USA x+521 pp.
ISBN: 0 7803 7894 6 Material Identity Number: XX-2003-03207
U.S. Copyright Clearance Center Code: 0 7803 7894 6/2003/$17.00
Conference Title: 2003 IEEE International Symposium on Semiconductor Manufacturing. Conference Proceedings
Conference Sponsor: IEEE Electron Devices Soc.; IEEE Components Packaging & Manuf. Technol. Soc.; Semicond. Equipment & Mater. Int. (SEMI); Soc. Applied Phys. Japan
Conference Date: 30 Sept.-2 Oct. 2003 Conference Location: San Jose, CA, USA
Medium: Also available on CD-ROM in PDF format
Language: English Document Type: Conference Paper (PA)
Treatment: Practical (P); Theoretical (T)
Abstract: In this presentation the importance of simulation as a tool to understand the behavior of systems and their interactions is discussed. As an example, with the help of simulations of a diffusion bay it was possible to compute the probability of failure of the equipment for different controllers. This information is then used in a simplified FAB to study the performance that can be expected for different scheduling policies. (16 Refs)
Subfile: B C E
Descriptors: failure analysis; integrated circuit manufacture; probability; production control; scheduling
Identifiers: diffusion bay simulation; overall FAB performance; probability; failure equipment; controllers; scheduling policies
Class Codes: B0170C (Project and design engineering); B0170N (Reliability); B0170E (Production facilities and engineering); B0170S (Control equipment and processes in production engineering); C3355 (Control applications in manufacturing processes); C3350E (Control applications in the electronics industry)

1/5/2 (Item 2 from file: 2)
DIALOG(R)File 2:INSPEC

7919723 INSPEC Abstract Number: C2004-05-1230D-070
Title: Probing changes in neural interaction during adaptation
Author(s): Liqiang Zhu; Ying-Cheng Lai; **Hoppensteadt, F.C.** ; Jiping He
Author Affiliation: Dept. of Electr. Eng., Arizona State Univ., Tempe, AZ, USA
Journal: Neural Computation vol.15, no.10 p.2359-77
Publisher: MIT Press,
Publication Date: Jan. 2003 Country of Publication: USA
CODEN: NEUCEB ISSN: 0899-7667
SICI: 0899-7667(200301)15:10L.2359:PCNI;1-E
Material Identity Number: N733-2003-010
U.S. Copyright Clearance Center Code: 0899-7667/03/$10.00
Language: English Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Abstract: A procedure is developed to probe the changes in the functional interactions among neurons in primary motor cortex of the monkey brain during adaptation. A monkey is trained to learn a new skill, moving its arm

to reach a target under the influence of external perturbations. The spike trains of multiple neurons in the primary motor cortex are recorded simultaneously. We utilize the methodology of directed transfer function, derived from a class of linear stochastic models, to quantify the causal interactions between the neurons. We find that the coupling between the motor neurons tends to increase during the adaptation but return to the original level after the adaptation. Furthermore, there is evidence that adaptation tends to affect the topology of the neural network, despite the approximate conservation of the average coupling strength in the network before and after the adaptation. (40 Refs)

Subfile: C

Descriptors: adaptive systems; biocomputing; brain models; learning systems; neural nets; stochastic processes; transfer functions

Identifiers: probing changes; neural interaction; adaptation; functional interactions; neurons; primary motor cortex; monkey brain; learning; external perturbations; spike trains; multiple neurons; transfer function; linear stochastic models; topology; neural network; approximate conservation; coupling strength

Class Codes: C1230D (Neural nets); C5290 (Neural computing techniques); C1290L (Systems theory applications in biology and medicine); C1340E (Self-adjusting control systems); C1310 (Control system analysis and synthesis methods); C1140 (Probability and statistics)

1/5/3 (Item 3 from file: 2)

DIALOG(R)File 2:INSPEC

7904814 INSPEC Abstract Number: A2004-09-8730-005

Title: Capacity of oscillatory associative-memory networks with error-free retrieval

Author(s): Nishikawa, T.; Ying-Cheng Lai; **Hoppensteadt, F.C.**

Author Affiliation: Dept. of Math., Arizona State Univ., Tempe, AZ, USA

Journal: Physical Review Letters vol.92, no.10 p.108101/1-4

Publisher: APS,

Publication Date: 12 March 2004 Country of Publication: USA

CODEN: PRLTAO ISSN: 0031-9007

SICI: 0031-9007(20040312)92:10L.1:COAM;1-K

Material Identity Number: P096-2004-011

U.S. Copyright Clearance Center Code: 0031-9007/2004/92(10)/108101(4)/$22 .50

Document Number: S0031-9007(04)03508-2

Language: English Document Type: Journal Paper (JP)

Treatment: Theoretical (T)

Abstract: Networks of coupled periodic oscillators (similar to the Kuramoto model) have been proposed as models of associative memory. However, error-free retrieval states of such oscillatory networks are typically unstable, resulting in a near zero capacity. This puts the networks at disadvantage as compared with the classical Hopfield network. Here we propose a simple remedy for this undesirable property and show rigorously that the error-free capacity of our oscillatory, associative-memory networks can be made as high as that of the Hopfield network. They can thus not only provide insights into the origin of biological memory, but can also be potentially useful for applications in information science and engineering. (23 Refs)

Subfile: A

Descriptors: asymptotic stability; brain models; Hopfield neural nets; neurophysiology; pattern formation

Identifiers: oscillatory associative-memory networks; error-free retrieval; associative memory models; coupled periodic oscillators; Hopfield network; biological memory; neural computations; Kuramoto model; pattern retrieval; phase deviation; local stability; global stability

Class Codes: A8730G (Memory storage and memorization (biophysical and biochemical processes)); A8710 (General, theoretical, and mathematical biophysics); A0547 (Nonlinear dynamical systems and bifurcations)

1/5/4 (Item 4 from file: 2)
DIALOG(R)File 2:INSPEC

7852719 INSPEC Abstract Number: A2004-05-0210-030, B2004-03-1230B-008
Title: System of phase oscillators with diagonalizable interactions
Author(s): Nishikawa, T.; **Hoppensteadt, F.C.**
Author Affiliation: Dept. of Math., Arizona State Univ., Tempe, AZ, USA
URL: http://www.siam.org/journals/siap/63-5/41113.html
Journal: SIAM Journal on Applied Mathematics vol.63, no.5 p.1615-26
Publication URL: http://www.siam.org/journals/siap/siap.htm
Publisher: SIAM,
Publication Date: 2002 Country of Publication: USA
CODEN: SMJMAP ISSN: 0036-1399
SICI: 0036-1399(2002)63:5L.1615:SPOW;1-J
Material Identity Number: S130-2003-004
U.S. Copyright Clearance Center Code: 0036-1399/02/$2.00+0.15
Language: English Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Abstract: We consider a system of N phase oscillators having randomly distributed natural frequencies and diagonalizable interactions among the oscillators. We show that, in the limit of N to infinity , all solutions of such a system are incoherent with probability one for any strength of coupling, which implies that there is no sharp transition from incoherence to coherence as the coupling strength is increased, in striking contrast to Kuramoto's (special) oscillator system. (20 Refs)
Subfile: A B
Descriptors: coherence; phase locked oscillators; probability; synchronisation; vectors
Identifiers: N phase oscillator systems; diagonalizable interactions; randomly distributed natural frequencies; incoherent system; probability; coupling strength; sharp transition; coherence; incoherence; Kuramoto oscillator system; synchronisation; random vector
Class Codes: A0210 (Algebra, set theory, and graph theory); A0250 (Probability theory, stochastic processes, and statistics); B1230B (Oscillators)

1/5/5 (Item 5 from file: 2)
DIALOG(R)File 2:INSPEC

7684244 INSPEC Abstract Number: A2003-16-0547-021, C2003-08-1230D-021
Title: Heterogeneity in oscillator networks: are smaller worlds easier to synchronize?
Author(s): Nishikawa, T.; Motter, A.E.; Ying-Cheng Lai; **Hoppensteadt, F.C.**
Author Affiliation: Dept. of Math., Arizona State Univ., Tempe, AZ, USA
Journal: Physical Review Letters vol.91, no.1 p.014101/1-4
Publisher: APS,
Publication Date: 4 July 2003 Country of Publication: USA
CODEN: PRLTAO ISSN: 0031-9007
SICI: 0031-9007(20030704)91:1L.1:HONS;1-Y
Material Identity Number: P096-2003-029
U.S. Copyright Clearance Center Code: 0031-9007/2003/91(1)/014101(4)/$20.00
Document Number: S0031-9007(03)04728-8
Language: English Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Abstract: Small-world and scale-free networks are known to be more easily synchronized than regular lattices, which is usually attributed to the smaller network distance between oscillators. Surprisingly, we find that networks with a homogeneous distribution of connectivity are more synchronizable than heterogeneous ones, even though the average network

distance is larger. We present numerical computations and analytical estimates on synchronizability of the network in terms of its heterogeneity parameters. Our results suggest that some degree of homogeneity is expected in naturally evolved structures, such as neural networks, where synchronizability is desirable. (42 Refs)
Subfile: A C
Descriptors: lattice theory; neural nets; nonlinear dynamical systems; numerical analysis; oscillations; synchronisation
Identifiers: heterogeneity; oscillator networks; synchronization; small-world networks; regular lattices; homogeneous distribution; numerical computations; analytical estimates; heterogeneity parameters; naturally evolved structures; neural networks; scale-free networks
Class Codes: A0547 (Nonlinear dynamical systems and bifurcations); A0260 (Numerical approximation and analysis); A0550 (Lattice theory and statistics; Ising problems); C1230D (Neural nets)

1/5/6 (Item 6 from file: 2)
DIALOG(R)File 2:INSPEC

7589746 INSPEC Abstract Number: A2003-10-0545-073, B2003-05-1165-007
Title: Numerical and experimental investigation of the effect of filtering on chaotic symbolic dynamics
Author(s): Liqiang Zhu; Ying-Cheng Lai; **Hoppensteadt, F.C.** ; Bollt, E.M.
Author Affiliation: Dept. of Electr. Eng., Arizona State Univ., Tempe, AZ, USA
Journal: Chaos vol.13, no.1 p.410-19
Publisher: AIP,
Publication Date: March 2003 Country of Publication: USA
CODEN: CHAOEH ISSN: 1054-1500
SICI: 1054-1500(200303)13:1L.410:NEIE;1-V
Material Identity Number: O608-2003-001
U.S. Copyright Clearance Center Code: 1054-1500/2003/13(1)/410(10)/$19.00
Document Number: S1054-1500(03)02401-7
Language: English Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Abstract: Motivated by the practical consideration of the measurement of chaotic signals in experiments or the transmission of these signals through a physical medium, we investigate the effect of filtering on chaotic symbolic dynamics. We focus on the linear, time-invariant filters that are used frequently in many applications, and on the two quantities characterizing chaotic symbolic dynamics: topological entropy and bit-error rate. Theoretical consideration suggests that the topological entropy is invariant under filtering. Since computation of this entropy requires that the generating partition for defining the symbolic dynamics be known, in practical situations the computed entropy may change as a filtering parameter is changed. We find, through numerical computations and experiments with a chaotic electronic circuit, that with reasonable care the computed or measured entropy values can be preserved for a wide range of the filtering parameter. (32 Refs)
Subfile: A B
Descriptors: chaos; entropy; nonlinear filters; nonlinear network analysis
Identifiers: chaotic symbolic dynamics; filtering; chaotic signals; time-invariant filters; topological entropy; bit-error rate; chaotic electronic circuit; filtering parameter
Class Codes: A0545 (Theory and models of chaotic systems); B1165 (Chaotic behaviour in circuits); B1160 (Nonlinear network analysis and design)

1/5/7 (Item 7 from file: 2)
DIALOG(R)File 2:INSPEC

7506331 INSPEC Abstract Number: A2003-04-8710-021, B2003-02-8520-074, C2003-02-1290H-045

Title: Smallest small-world network

Author(s): Nishikawa, T.; Motter, A.E.; Ying-Cheng Lai; **Hoppensteadt, F.C.**

Author Affiliation: Dept. of Math., Arizona State Univ., Tempe, AZ, USA

Journal: Physical Review E (Statistical, Nonlinear, and Soft Matter Physics) vol.66, no.4 p.46139-1-5

Publisher: APS through AIP,

Publication Date: Oct. 2002 Country of Publication: USA

CODEN: PLEEE8 ISSN: 1063-651X

SICI: 1063-651X(200210)66:4L.46139:SSWN;1-2

Material Identity Number: J677-2002-012

U.S. Copyright Clearance Center Code: 1063-651X/2002/66(4)/046139(5)/$20.00

Document Number: S1063-651X(02)16410-5

Language: English Document Type: Journal Paper (JP)

Treatment: Theoretical (T)

Abstract: Efficiency in passage times is an important issue in designing networks, such as transportation or computer networks. The small-world networks have structures that yield high efficiency, while keeping the network highly clustered. We show that among all networks with the small-world structure, the most efficient ones have a "single center" node, from which all shortcuts are connected to uniformly distributed nodes over the network. The networks with several centers and a connected subnetwork of shortcuts are shown to be "almost" as efficient. Genetic-algorithm simulations further support our results. (14 Refs)

Subfile: A B C

Descriptors: computer networks; genetic algorithms; neural nets; simulation; transportation

Identifiers: small-world network; passage times; transportation; computer networks; network structures; uniformly distributed nodes; single-center node; connected subnetwork; shortcuts; ground transportation; average path length; information flow; architecture; natural organisms; neural network; biology; natural selection; clustering; metabolic networks; neural nets; genetic algorithm simulations; highly clustered. networks

Class Codes: A8710 (General, theoretical, and mathematical biophysics); B8520 (Transportation); C1290H (Systems theory applications in transportation); C5620 (Computer networks and techniques); C1180 (Optimisation techniques); C1220 (Simulation, modelling and identification)

1/5/8 (Item 8 from file: 2)

DIALOG(R)File 2:INSPEC

7003014 INSPEC Abstract Number: A2001-18-0545-008

Title: Phase clustering and transition to phase synchronization in a large number of coupled nonlinear oscillators

Author(s): Zonghua Liu; Ying-Cheng Lai; **Hoppensteadt, F.C.**

Author Affiliation: Dept. of Math., Arizona State Univ., Tempe, AZ, USA

Journal: Physical Review E (Statistical, Nonlinear, and Soft Matter Physics) vol.63, no.5, pt.1-2 p.055201/1-4

Publisher: APS through AIP,

Publication Date: May 2001 Country of Publication: USA

CODEN: PLEEE8 ISSN: 1063-651X

SICI: 1063-651X(200105)63:5:1/2L.1:PCTP;1-2

Material Identity Number: J677-2001-006

U.S. Copyright Clearance Center Code: 1063-651X/2001/63(5)/055201(4)/$20.00

Document Number: S1063-651X(01)50105-1

Language: English Document Type: Journal Paper (JP)

Treatment: Theoretical (T)

Abstract: The transition to phase synchronization in systems consisting of a large number (N) of coupled nonlinear oscillators via the route of

phase clustering (phase synchronization among subsets of oscillators) is investigated. We elucidate the mechanism for the merger of phase clusters and find an algebraic scaling between the critical coupling parameter required for phase synchronization and N. Our result implies that, in realistic situations, phase clustering may be more prevalent than full phase synchronization. (19 Refs)
Subfile: A
Descriptors: chaos; synchronisation
Identifiers: phase clustering; transition to phase synchronization; coupled nonlinear oscillators; phase clusters; algebraic scaling; critical coupling parameter; chaos
Class Codes: A0545 (Theory and models of chaotic systems)

1/5/9 (Item 9 from file: 2)
DIALOG(R)File 2:INSPEC

6969312 INSPEC Abstract Number: C2001-08-1290L-017
Title: Oscillatory model of novelty detection
Author(s): Borisyuk, R.; Denham, M.; **Hoppensteadt, F.** ; Kazanovich, Y.; Vinogradova, O.
Author Affiliation: Centre for Neural & Adaptive Syst, Plymouth, UK
Journal: Network: Computation in Neural Systems vol.12, no.1 p.1-20
Publisher: IOP Publishing,
Publication Date: Feb. 2001 Country of Publication: UK
CODEN: NTWREZ ISSN: 0954-898X
SICI: 0954-898X(200102)12:1L.1:OMND;1-T
Material Identity Number: N636-2001-001
U.S. Copyright Clearance Center Code: 0954-898X/2001/010001+20$30.00
Document Number: S0954-898X(01)19653-3
Language: English Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Abstract: A model of novelty detection is developed which is based on an oscillatory mechanism of memory formation and information processing. The frequency encoding of the input information and adaptation of natural frequencies of network oscillators to the frequency of the input signal are used as the mechanism of information storage. The resonance amplification of network activity is used as a recognition principle for familiar stimuli. Application of the model to novelty detection in the hippocampus is discussed. (34 Refs)
Subfile: C
Descriptors: brain models; neural nets; oscillators
Identifiers: novelty detection; oscillatory mechanism; memory formation; information processing; frequency encoding; hippocampus; network activity
Class Codes: C1290L (Systems theory applications in biology and medicine) ; C1230D (Neural nets); C5340 (Associative storage)

1/5/10 (Item 10 from file: 2)
DIALOG(R)File 2:INSPEC

6864591 INSPEC Abstract Number: B2001-04-2575D-006, C2001-04-5290-007
Title: Synchronization of MEMS resonators and mechanical neurocomputing
Author(s): **Hoppensteadt, F.C.** ; Izhikevich, E.M.
Author Affiliation: Center for Syst. Sci. & Eng., Arizona State Univ., Tempe, AZ, USA
Journal: IEEE Transactions on Circuits and Systems I: Fundamental Theory and Applications vol.48, no.2 p.133-8
Publisher: IEEE,
Publication Date: Feb. 2001 Country of Publication: USA
CODEN: ITCAEX ISSN: 1057-7122
SICI: 1057-7122(200102)48:2L.133:SMRM;1-8
Material Identity Number: 0940-2001-004

U.S. Copyright Clearance Center Code: 1057-7122/2001/$10.00
Document Number: S1057-7122(01)01392-7
Language: English   Document Type: Journal Paper (JP)
Treatment: Theoretical (T)

Abstract: We combine here two well-known and established concepts: microelectromechanical systems (MEMS) and neurocomputing. First, we consider MEMS oscillators having low amplitude activity and we derive a simple mathematical model that describes nonlinear phase-locking dynamics in them. Then, we investigate a theoretical possibility of using MEMS oscillators to build an oscillatory neurocomputer having autocorrelative associative memory. The neurocomputer stores and retrieves complex oscillatory patterns in the form of synchronized states with appropriate phase relations between the oscillators. Thus, we show that MEMS alone can be used to build a sophisticated information processing system (U.S. provisional patent 60/178,654). (19 Refs)

Subfile: B C
Descriptors: content-addressable storage; micromechanical resonators; neural nets; phase locked oscillators; synchronisation
Identifiers: synchronization; MEMS resonator; mechanical neurocomputing; microelectromechanical system; MEMS oscillator; mathematical model; nonlinear phase locking dynamics; autocorrelative associative memory; information processing system
Class Codes: B2575D (Design and modelling of micromechanical devices); C5290 (Neural computing techniques); C5340 (Associative storage)

1/5/11 (Item 11 from file: 2)
DIALOG(R)File 2:INSPEC

6735048 INSPEC Abstract Number: B2000-11-1295-013, C2000-11-1230D-098
Title: Neural computations by networks of oscillators
Author(s): **Hoppensteadt, F.** ; Izhikevich, E.
Author Affiliation: Sys. Sci. & Eng. Res. Center, Arizona State Univ., Tempe, AZ, USA
Conference Title: Proceedings of the IEEE-INNS-ENNS International Joint Conference on Neural Networks. IJCNN 2000. Neural Computing: New Challenges and Perspectives for the New Millennium   Part vol.4   p.41-4 vol.4
Editor(s): Amari, S-I; Giles, C.L.; Gori, M.; Piuri, V.
Publisher: IEEE Comput. Soc, Los Alamitos, CA, USA
Publication Date: 2000 Country of Publication: USA 6 vol.(xxxvii+371+xxxvi+313+679+630+669+659) pp.
ISBN: 0 7695 0619 4   Material Identity Number: XX-2000-01709
U.S. Copyright Clearance Center Code: 0 7695 0619 4/2000/$10.00
Conference Title: Proceedings of IEEE-INNS-ENNS International Joint Conference on Neural Networks
Conference Sponsor: IEEE Neural Network Council; Int. Neural Netowrks Soc.; Eur. Neural Network Soc.; Japanese Neural Network Soc.; AEI - Italian Assoc. Electr. & Electron. Eng.; SIREN - Italian Assoc. Neural Netowrks; AI*IA - Italian Assoc. Artifical Intelligence
Conference Date: 24-27 July 2000   Conference Location: Como, Italy
Language: English   Document Type: Conference Paper (PA)
Treatment: Theoretical (T)

Abstract: We describe here how a network of oscillators can perform neural computations. In particular, it shown how the connectivity within the network can be created to memorize data in terms of phase relations between synchronized states. The memorized states are extracted through correlation calculations. The influence of noise on the system is discussed. (4 Refs)

Subfile: B C
Descriptors: correlation methods; neural nets; noise; oscillators
Identifiers: oscillator networks; neural computations; connectivity; phase relations; synchronized states; noise
Class Codes: B1295 (Neural nets (circuit implementations)); B1230B (Oscillators); B6140 (Signal processing and detection); C1230D (Neural nets); C1260S (Signal processing theory)

1/5/12 (Item 12 from file: 2)
DIALOG(R)File 2:INSPEC

6716665 INSPEC Abstract Number: A2000-21-4280V-002, B2000-11-4180-002, C2000-11-5290-005
Title: Synchronization of laser oscillators, associative memory, and optical neurocomputing
Author(s): **Hoppensteadt, F.C.** ; Izhikevich, E.M.
Author Affiliation: Center for Syst. Sci. & Eng., Arizona State Univ., Tempe, AZ, USA
Journal: Physical Review E (Statistical Physics, Plasmas, Fluids, and Related Interdisciplinary Topics) vol.62, no.3 p.4010-13
Publisher: APS through AIP,
Publication Date: Sept. 2000 Country of Publication: USA
CODEN: PLEEE8 ISSN: 1063-651X
SICI: 1063-651X(200009)62:3L.4010:SLOA;1-U
Material Identity Number: A367-2000-009
U.S. Copyright Clearance Center Code: 1063-651X/2000/62(3)/4010(4)/$15.00
Document Number: S1063-651X(00)04709-7
Language: English Document Type: Journal Paper (JP)
Treatment: Applications (A); Theoretical (T)
Abstract: We investigate here possible neurocomputational features of networks of laser oscillators. Our approach is similar to classical optical neurocomputing where artificial neurons are lasers and connection matrices are holographic media. However, we consider oscillatory neurons communicating via phases rather than amplitudes. Memorized patterns correspond to synchronized states where the neurons oscillate with equal frequencies and with prescribed phase relations. The mechanism of recognition is related to phase locking. (19 Refs)
Subfile: A B C
Descriptors: associative processing; content-addressable storage; laser beam applications; optical neural nets; synchronisation
Identifiers: synchronization; laser oscillators; associative memory; optical neurocomputing; neurocomputational features; networks; artificial neurons; lasers; connection matrices; holographic media; oscillatory neuron communication; phases; memorized patterns; synchronized states; neuron oscillation; phase relations; recognition mechanism; phase locking
Class Codes: A4280V (Optical computers, logic elements, and interconnects); A4262 (Laser applications); B4180 (Optical logic devices and optical computing techniques); B4360 (Laser applications); C5290 (Neural computing techniques); C5270 (Optical computing techniques); C5340 (Associative storage)

1/5/13 (Item 13 from file: 2)
DIALOG(R)File 2:INSPEC

6633570 INSPEC Abstract Number: B2000-08-1295-001, C2000-08-5190-002
Title: Pattern recognition via synchronization in phase-locked loop neural networks
Author(s): **Hoppensteadt, F.C.** ; Izhikevich, E.M.
Author Affiliation: Center for Syst. Sci. & Eng., Arizona State Univ., Tempe, AZ, USA
Journal: IEEE Transactions on Neural Networks vol.11, no.3 p.734-8
Publisher: IEEE,
Publication Date: May 2000 Country of Publication: USA
CODEN: ITNNEP ISSN: 1045-9227
SICI: 1045-9227(200005)11:3L.734:PRSP;1-Q
Material Identity Number: N784-2000-003
U.S. Copyright Clearance Center Code: 1045-9227/2000/$10.00
Document Number: S1045-9227(00)04298-3

Language: English   Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Abstract: We propose a novel architecture of an oscillatory neural network that consists of phase-locked loop (PLL) circuits. It stores and retrieves complex oscillatory patterns as synchronized states with appropriate phase relations between neurons. (16 Refs)
Subfile: B C
Descriptors: neural chips; oscillations; pattern recognition; phase locked loops; synchronisation; voltage-controlled oscillators
Identifiers: temporal pattern recognition; synchronization; phase-locked loop neural networks; oscillatory neural network; PLL circuits; complex oscillatory patterns; phase relations; VCO
Class Codes: B1295 (Neural nets (circuit implementations)); B6135E (Image recognition); B1250 (Modulators, demodulators, discriminators and mixers); B1230B (Oscillators); C5190 (Neural net devices); C1250 (Pattern recognition); C5260 (Digital signal processing); C1230D (Neural nets); C5290 (Neural computing techniques)

1/5/14 (Item 14 from file: 2)
DIALOG(R)File 2:INSPEC

6571798 INSPEC Abstract Number: A2000-11-8730-009, C2000-06-1290L-028
Title: Oscillatory model of the hippocampal memory
Author(s): Borisyuk, R.; **Hoppensteadt, F.**
Author Affiliation: Plymouth Univ., UK
Conference Title: IJCNN'99. International Joint Conference on Neural Networks. Proceedings (Cat. No.99CH36339) Part vol.1 p.42-5 vol.1
Publisher: IEEE, Piscataway, NJ, USA
Publication Date: 1999 Country of Publication: USA 6 vol. lxii+4439 pp.
ISBN: 0 7803 5529 6 Material Identity Number: XX-1999-01617
U.S. Copyright Clearance Center Code: 0 7803 5529 6/99/$10.00
Conference Title: Proceedings of International Conference on Neural Networks
Conference Sponsor: Int. Neural Network Soc.; Neural Netowrks Council of IEEE
Conference Date: 10-16 July 1999 Conference Location: Washington, DC, USA
Language: English   Document Type: Conference Paper (PA)
Treatment: Theoretical (T)
Abstract: We describe a biologically inspired oscillatory neural network for memorizing temporal sequences of neural activity patterns. The neural network consists of interactive neural oscillators with all-to-all excitatory connections forced by a slow T-periodic signal. The dynamics of the network are viewed through a time window with duration T. The network memorizes binary patterns in terms of low and high activity of the corresponding oscillators. The learning rule is temporally asymmetric, and it takes into account the activity level of pre- and post-"synaptic" oscillators in two contiguous time windows. Recall by the network is fast: all memorized patterns of sequences are reproduced in the correct order during the same time window, but with a short time delay. The applicability of these results to studies of the hippocampus is discussed. (10 Refs)
Subfile: A C
Descriptors: brain models; neural nets; neurophysiology
Identifiers: hippocampal memory; oscillatory model; oscillatory neural network; temporal sequences; time window; learning rule; hippocampus; time delay
Class Codes: A8730G (Memory storage and memorization (biophysical and biochemical processes)); A8730E (External and internal data communications, nerve conduction and synaptic transmission); A8710 (General, theoretical, and mathematical biophysics); C1290L (Systems theory applications in biology and medicine); C1230D (Neural nets)

1/5/15 (Item 15 from file: 2)
DIALOG(R)File 2:INSPEC

6404107 INSPEC Abstract Number: A1999-24-8730-012, C1999-12-1290L-080
Title: Oscillatory models of the hippocampus: a study of spatio-temporal patterns of neural activity
Author(s): Borisyuk, R.; **Hoppensteadt, F.**
Author Affiliation: Centre for Neural & Adaptive Syst., Univ. of Plymouth, UK
Journal: Biological Cybernetics vol.81, no.4 p.359-71
Publisher: Springer-Verlag,
Publication Date: Oct. 1999 Country of Publication: Germany
CODEN: BICYAF ISSN: 0340-1200
SICI: 0340-1200(199910)81:4L.359:OMHS;1-X
Material Identity Number: B169-1999-010
Language: English Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Abstract: Spatial patterns of theta-rhythm activity in oscillatory models of the hippocampus are studied here using canonical models for both Hodgkin's class-1 and class-2 excitable neuronal systems. Dynamics of these models are studied in both the frequency domain, to determine phase-locking patterns, and in the time domain, to determine the amplitude responses resulting from phase-locking patterns. Computer simulations presented here demonstrate that phase deviations (timings) between inputs from the medial septum and the entorhinal cortex can create spatial patterns of theta-rhythm phase-locking. In this way, the authors show that the timing of inputs (not only their frequencies alone) can encode specific patterns of theta-rhythm activity. This study suggests new experiments to determine temporal and spatial synchronization. (45 Refs)
Subfile: A C
Descriptors: brain models; neurophysiology; oscillations
Identifiers: spatio-temporal neural activity patterns; hippocampus; oscillatory models; theta-rhythm activity; canonical models; Hodgkin's class-1 excitable neuronal system; Hodgkin's class-2 excitable neuronal system; medial septum; theta-rhythm phase-locking; specific patterns encoding; spatial synchronization; temporal synchronization; inputs timing
Class Codes: A8730E (External and internal data communications, nerve conduction and synaptic transmission); A8710 (General, theoretical, and mathematical biophysics); C1290L (Systems theory applications in biology and medicine); C1220 (Simulation, modelling and identification)

1/5/16 (Item 16 from file: 2)
DIALOG(R)File 2:INSPEC

6249941 INSPEC Abstract Number: A1999-12-8730-012, B1999-06-7500-007, C1999-06-7330-315
Title: Oscillatory neurocomputers with dynamic connectivity
Author(s): **Hoppensteadt, F.C.** ; Izhikevich, E.M.
Author Affiliation: Center for Syst. Sci. & Eng., Arizona State Univ., Tempe, AZ, USA
Journal: Physical Review Letters vol.82, no.14 p.2983-6
Publisher: APS,
Publication Date: 5 April 1999 Country of Publication: USA
CODEN: PRLTAO ISSN: 0031-9007
SICI: 0031-9007(19990405)82:14L.2983:ONWD;1-K
Material Identity Number: P096-1999-016
U.S. Copyright Clearance Center Code: 0031-9007/99/82(14)/2983(4)$15.00
Document Number: S0031-9007(99)08813-4
Language: English Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Abstract: The authors' study of thalamo-cortical systems suggests a new architecture for a neurocomputer that consists of oscillators having

different frequencies and that are connected weakly via a common medium forced by an external input. Even though such oscillators are all interconnected homogeneously, the external input imposes a dynamic connectivity. The authors use Kuramoto's model to illustrate the idea and to prove that such a neurocomputer has oscillatory associative properties. Then, they discuss a general case. The advantage of such a neurocomputer is that it can be built using voltage controlled oscillators, optical oscillators, lasers, microelectromechanical systems, Josephson junctions, macromolecules, or oscillators of other kinds. (16 Refs)

Subfile: A B C

Descriptors: biocomputers; brain models; macromolecules; micromechanical devices; neurophysiology; oscillators; voltage-controlled oscillators

Identifiers: oscillatory neurocomputers; dynamic connectivity; thalamo-cortical systems; external input; homogeneously interconnected oscillators; Kuramoto's model; oscillatory associative properties; optical oscillators; lasers; microelectromechanical systems; Josephson junctions

Class Codes: A8730 (Biophysics of neurophysiological processes); B7500 (Medical physics and biomedical engineering); B1230B (Oscillators); C7330 (Biology and medical computing)

1/5/17 (Item 17 from file: 2)

DIALOG(R)File 2:INSPEC

6142237 INSPEC Abstract Number: C1999-02-7480-128

Title: A Mini-FAB simulation model comparing FIFO and MIVP(R) schedule policies (outer loop), and PID and H/sup infinity / machine controllers (inner loop) for semiconductor diffusion bay maintenance

Author(s): Flores-Godoy, J.-J.; Yan Wang; Collins, D.W.; **Hoppensteadt, F.** ; Tsakalis, K.

Author Affiliation: Coll. of Eng. & Appl. Sci., Arizona State Univ., Tempe, AZ, USA

Conference Title: IECON '98. Proceedings of the 24th Annual Conference of the IEEE Industrial Electronics Society (Cat. No.98CH36200) Part vol.1 p.253-8 vol.1

Publisher: IEEE, New York, NY, USA

Publication Date: 1998 Country of Publication: USA 4 vol. xxix+2635 pp.

ISBN: 0 7803 4503 7 Material Identity Number: XX-1998-02833

U.S. Copyright Clearance Center Code: 0 7803 4503 7/98/$10.00

Conference Title: IECON '98. Proceedings of the 24th Annual Conference of the IEEE Industrial Electronics Society

Conference Sponsor: IEEE Ind. Electron. Soc.; Eur. Centre for Mechatronics; Soc. Instrum. & Control Eng. Japan (SICE)

Conference Date: 31 Aug.-4 Sept. 1998 Conference Location: Aachen, Germany

Language: English Document Type: Conference Paper (PA)

Treatment: Theoretical (T)

Abstract: This Multiscale Integration of Manufacturing and Assembly Processes (MIMAP) demonstration project investigates the integration of two or more Thrust Area Groups (TAGs) by creating a flow of information and processes from two areas of research. The control theory research of two different controllers for diffusion furnaces used in semiconductor manufacturing which predict a specific window of machine failure, the mean-time-before-failure (MTBF). The objective is to increase yield, decrease cycle time, work-in-progress (WIP) and production costs. A global factory Minimum Inventory Variability Scheduling policy (MIVP(R)), used to decrease cycle time and cycle time variance when compared to a first-in-first-out (FIFO) scheduling policy, was used to make the comparisons between the two inner and outer loop controllers. The project's Cross Cutting Methodologies (CCMs) is ensured by the participation of faculty from three different colleges (LAS, CEAS, and CTAS) and two electrical engineering doctoral students. (20 Refs)

Subfile: C

Descriptors: H/sup infinity / control; manufacturing processes; process

control; three-term control
Identifiers: Mini-FAB simulation model; MIMAP demonstration project; Thrust Area Groups; semiconductor manufacturing; mean-time-before-failure; MTBF; Minimum Inventory Variability Scheduling policy; cycle time; first-in-first-out scheduling policy; Cross Cutting Methodologies; PID manufacturing process control; H/sup infinity / machine controllers
Class Codes: C7480 (Production engineering computing); C7420 (Control engineering computing); C1330 (Optimal control); C3355 (Control applications in manufacturing processes)

1/5/18 (Item 18 from file: 2)
DIALOG(R)File 2:INSPEC

6027321 INSPEC Abstract Number: B9810-2560-004, C9810-1290F-117
Title: Investigation of minimum inventory variability scheduling policies in a large semiconductor manufacturing facility
Author(s): Collins, D.W.; **Hoppensteadt, F.C.**
Author Affiliation: Dept. of Manuf. & Aeronaut. Eng. Technol., Arizona State Univ., Mesa, AZ, USA
Conference Title: Proceedings of the 1997 American Control Conference (Cat. No.97CH36041) Part vol.3 p.1924-8 vol.3
Publisher: American Autom. Control Council, Evanston, IL, USA
Publication Date: 1997 Country of Publication: USA 6 vol. (lix+xi+xvii+xii+xvii+xii+3994) pp.
ISBN: 0 7803 3832 4 Material Identity Number: XX98-02093
U.S. Copyright Clearance Center Code: 0 7803 3832 4/97/$10.00
Conference Title: Proceedings of 16th American CONTROL Conference
Conference Sponsor: American Autom. Control Council; U.S. Nat. Member Organ. IFAC
Conference Date: 4-6 June 1997 Conference Location: Albuquerque, NM, USA
Language: English Document Type: Conference Paper (PA)
Treatment: Theoretical (T)
Abstract: This paper describes some problems and investigations encountered when implementing new resource scheduling policies in a large semiconductor manufacturing facility (FAB). The FAB described here uses a product release policy based on customer orders and a work-in-progress (WIP) chart. The scheduling of resource tools is done on a first in, first out (FIFO) basis on high speed tools and due date first (DDF) at bottleneck tools, except for high priority LOTS, called MAXIs. This presentation describes briefly the theory behind minimum inventory variability scheduling policies. A heuristic explanation of the minimum inventory variability for resource scheduling policies is given here. Finally a large semiconductor manufacturing facility is discussed in generic terms, including (sanitized) data collection. The results of the baseline output and historical data are compared to MIVSP. (13 Refs)
Subfile: B C
Descriptors: heuristic programming; production control; resource allocation; semiconductor device manufacture
Identifiers: minimum inventory variability scheduling policies; large semiconductor manufacturing facility; resource scheduling policies; product release policy; customer orders; work-in-progress chart; WIP chart; FIFO resource tool scheduling; due-date-first resource tool scheduling; high-speed tools; bottleneck tools; MIVSP; heuristic explanation; sanitized data collection
Class Codes: B2560 (Semiconductor devices); B0170E (Production facilities and engineering); C1290F (Systems theory applications in industry); C3350E (Control applications in the electronics industry); C1230 (Artificial intelligence)

1/5/19 (Item 19 from file: 2)
DIALOG(R)File 2:INSPEC

5735121 INSPEC Abstract Number: A9723-8730-013
Title: Wave propagation in mathematical models of striated cortex
Author(s): **Hoppensteadt, F.C.** ; Mittelmann, H.D.
Author Affiliation: Dept. of Math., Arizona State Univ., Tempe, AZ, USA
Journal: Journal of Mathematical Biology vol.35, no.8 p.988-94
Publisher: Springer-Verlag,
Publication Date: 1997 Country of Publication: Germany
CODEN: JMBLAJ ISSN: 0303-6812
SICI: 0303-6812(1997)35:8L.988:WPMM;1-#
Material Identity Number: J298-97008
Language: English Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Abstract: The models and simulations here demonstrate that steady progressing waves are possible in networks whose elements are near saddle-node on limit cycle bifurcations. Such networks arise in studies of the neocortex, and cortical waves of this kind have been observed. There are many areas of the brain whose function is based on propagation of activity, such as sound location in the nucleus laminaris. It is also possible that propagation of neural activity in the hippocampus is important for navigation and memorization. The authors have shown here that striated structures can support waves having different speeds which is not possible in single layer structures. These waves in striated structures moving at different speeds can create dynamic patterns with brief intervals of coincidence that are believed to play important roles in brain function. (15 Refs)
Subfile: A
Descriptors: brain models; wave propagation
Identifiers: striated cortex; mathematical models; steady progressing waves; neocortex; cortical waves; activity propagation; hippocampus; nucleus laminaris; memorization; navigation; wave speed; brain function; sound location; dynamic patterns
Class Codes: A8730 (Biophysics of neurophysiological processes); A8710 (General, theoretical, and mathematical biophysics)

1/5/20 (Item 20 from file: 2)
DIALOG(R)File 2:INSPEC

5717337 INSPEC Abstract Number: B9711-0170E-015, C9711-1290F-118
Title: Implementation of Minimum Inventory Variability Scheduling 1-Step Ahead Policy(R) in a large semiconductor manufacturing facility
Author(s): Collins, D.W.; Williams, K.; **Hoppensteadt, F.C.**
Author Affiliation: Dept. of Manuf. & Aeronaut. Eng. Technol., Arizona State Univ. East, Mesa, AZ, USA
Conference Title: 1997 IEEE 6th International Conference on Emerging Technologies and Factory Automation Proceedings (Cat. No.97TH8314) p. 497-504
Publisher: IEEE, New York, NY, USA
Publication Date: 1997 Country of Publication: USA xxi+573 pp.
ISBN: 0 7803 4192 9 Material Identity Number: XX97-02370
U.S. Copyright Clearance Center Code: 0 7803 4192 9/97/$10.00
Conference Title: 1997 IEEE 6th International Conference on Emerging Technologies and Factory Automation Proceedings, EFTA '97
Conference Sponsor: IEEE Ind. Electron. Soc.; Soc. Instrum. & Control Eng. Japan; Mech. Syst. Panel ASME Dynamic Syst. & Control Div
Conference Date: 9-12 Sept. 1997 Conference Location: Los Angeles, CA, USA
Language: English Document Type: Conference Paper (PA)
Treatment: Practical (P); Theoretical (T)
Abstract: This paper describes an implementation of the 1-Step Ahead Minimum Inventory Variability Resource Scheduling Policy(R), in a large semiconductor facility (FAB) over the period from May, 1996, through January, 1997. The FAB described here uses a product release policy based

on customer orders and a work-in-progress (WIP) chart. The scheduling of resource tools was done on a first in, first out (FIFO) basis on high speed tools and due date first (DDF) at bottleneck tools, except for high priority lots, called MAXIs. The FAB is discussed in generic terms (sanitized) because of the proprietary nature of the devices manufactured. Percentages of change in cycle time and output are presented. (18 Refs)

Subfile: B C

Descriptors: digital simulation; production control; queueing theory; semiconductor device manufacture; stock control

Identifiers: Minimum Inventory Variability Scheduling 1-Step Ahead Policy ; large semiconductor manufacturing facility; FAB; product release policy; customer orders; work-in-progress chart; resource tools; FIFO basis; high speed tools; due date first; bottleneck tools; high priority lots; MAXIs

Class Codes: B0170E (Production facilities and engineering); B0240C (Queueing theory); C1290F (Systems theory applications in industry); C7480 (Production engineering computing); C1140C (Queueing theory); C7410D (Electronic engineering computing)

1/5/21 (Item 21 from file: 2)

DIALOG(R)File 2:INSPEC

5691458 INSPEC Abstract Number: C9710-1230D-167

Title: Associative memory of weakly connected oscillators

Author(s): **Hoppensteadt, F.C.** ; Izhikevich, E.M.

Author Affiliation: Center for Syst. Sci. & Eng., Arizona State Univ., Tempe, AZ, USA

Conference Title: 1997 IEEE International Conference on Neural Networks. Proceedings (Cat. No.97CH36109) Part vol.2 p.1135-8 vol.2

Publisher: IEEE, New York, NY, USA

Publication Date: 1997 Country of Publication: USA 4 vol. xlvi+2570 pp.

ISBN: 0 7803 4122 8 Material Identity Number: XX97-01985

U.S. Copyright Clearance Center Code: 0 7803 4122 8/97/$10.00

Conference Title: Proceedings of International Conference on Neural Networks (ICNN'97)

Conference Sponsor: IEEE Neural Networks Council (NNC)

Conference Date: 9-12 June 1997 Conference Location: Houston, TX, USA

Language: English Document Type: Conference Paper (PA)

Treatment: Theoretical (T)

Abstract: It is a well-known fact that oscillatory networks can operate as Hopfield-like neural networks, the only difference being that their attractors are limit cycles: one for each memorized pattern. The neuron activities are synchronized on the limit cycles, and neurons oscillate with fixed phase differences (time delays). We prove that this property is a natural attribute of general weakly connected neural networks, and it is relatively independent of the equations that describe the network activity. In particular, we prove an analogue of the Cohen-Grossberg convergence theorem for oscillatory neural networks. (0 Refs)

Subfile: C

Descriptors: content-addressable storage; convergence; Hebbian learning; Hopfield neural nets; limit cycles; oscillations

Identifiers: associative memory; weakly connected oscillators; Hopfield-like neural networks; limit cycles; neuron activities; Cohen-Grossberg convergence theorem; oscillatory neural networks

Class Codes: C1230D (Neural nets); C5290 (Neural computing techniques); C5340 (Associative storage)

1/5/22 (Item 22 from file: 2)

DIALOG(R)File 2:INSPEC

5679059 INSPEC Abstract Number: A9719-8730C-015, C9710-1290L-019

Title: Thalamo-cortical interactions modeled by forced weakly connected oscillatory networks

Author(s): **Hoppensteadt, F.C.** ; Izhikevich, E.M.
Author Affiliation: Center for Syst. Sci. & Eng., Arizona State Univ., Tempe, AZ, USA

Conference Title: 1997 IEEE International Conference on Neural Networks. Proceedings (Cat. No.97CH36109) Part vol.1 p.328-31 vol.1
Publisher: IEEE, New York, NY, USA
Publication Date: 1997 Country of Publication: USA 4 vol. xlvi+2570 pp.
ISBN: 0 7803 4122 8 Material Identity Number: XX97-01419
U.S. Copyright Clearance Center Code: 0 7803 4122 8/97/$10.00
Conference Title: Proceedings of International Conference on Neural Networks (ICNN'97)
Conference Sponsor: IEEE Neural Networks Council (NNC)
Conference Date: 9-12 June 1997 Conference Location: Houston, TX, USA
Language: English Document Type: Conference Paper (PA)
Treatment: Theoretical (T)

Abstract: In this paper we do not discuss what a thalamo-cortical system modeled by a weakly connected oscillators can do, but we rather discuss what it cannot do. Interactions between any two cortical columns having oscillatory dynamics crucially depend on their frequencies. When the frequencies are different, the interactions are functionally insignificant (i.e., they average to zero) even when there are synaptic connections between the cortical columns. We say that there is a frequency gap that prevents interactions. When the frequencies are equal (or close) the oscillators interact via phase deviations. By adjusting the frequency of oscillations, each cortical column can turn on or off its connections with other columns. This mechanism resembles that of selective tuning in frequency modulated (FM) radios. A weak non-constant thalamic input can remove the frequency gap and link any two oscillators provided the input is chosen appropriately. In the case of many cortical columns with incommensurable frequency gaps the thalamic forcing will be chaotic. By adjusting its temporal activity, the thalamus has complete control over information processing taking place in important parts of the cortex. (4 Refs)

Subfile: A C
Descriptors: bifurcation; brain models; dynamics; neural nets; neurophysiology; oscillations
Identifiers: thalamo-cortical interactions; forced weakly connected oscillatory networks; oscillatory dynamics; synaptic connections; phase deviations; weak nonconstant thalamic input; temporal activity; cortex
Class Codes: A8730C (Electrical activity in neurophysiological processes) ; A8710 (General, theoretical, and mathematical biophysics); A8730E (External and internal data communications, nerve conduction and synaptic transmission); C1290L (Systems theory applications in biology and medicine)

1/5/23 (Item 23 from file: 2)
DIALOG(R)File 2:INSPEC

5679058 INSPEC Abstract Number: A9719-8730-012, C9710-1290L-018
Title: Canonical models for mathematical neuroscience

Author(s): **Hoppensteadt, F.C.** ; Izhikevich, E.M.
Author Affiliation: Center for Syst. Sci. & Eng., Arizona State Univ., Tempe, AZ, USA

Conference Title: 1997 IEEE International Conference on Neural Networks. Proceedings (Cat. No.97CH36109) Part vol.1 p.324-7 vol.1
Publisher: IEEE, New York, NY, USA
Publication Date: 1997 Country of Publication: USA 4 vol. xlvi+2570 pp.
ISBN: 0 7803 4122 8 Material Identity Number: XX97-01419
U.S. Copyright Clearance Center Code: 0 7803 4122 8/97/$10.00
Conference Title: Proceedings of International Conference on Neural Networks (ICNN'97)

Conference Sponsor: IEEE Neural Networks Council (NNC)
Conference Date: 9-12 June 1997 Conference Location: Houston, TX, USA
Language: English Document Type: Conference Paper (PA)
Treatment: Theoretical (T)

Abstract: A major drawback to most mathematical models in neuroscience is that they are either far away from reality or the results depend on the specific model. A promising alternative approach takes advantage of the fact that many complicated systems behave similarly when they operate near critical regimes, such as bifurcations. Using nonlinear dynamical system theory it is possible to prove that all systems near certain critical regimes are governed by the same model, namely a canonical model. Briefly, a model is canonical if there is a continuous change of variables that transforms any other model that is near the same critical regime to this one. Thus, the question of plausibility of a mathematical model is replaced by the question of plausibility of the critical regime. Another advantage of the canonical model approach to neuroscience is that rigorous derivation of the models is possible even when only partial information is known about anatomy and physiology of brain structures. Then, studying canonical models can reveal some general laws and restrictions. In particular, one can determine what certain brain structures cannot accomplish regardless of their mathematical model. Since the existence of such canonical models might sound too good to be true, we present a list of some of them for weakly connected neural networks. Studying such canonical models provides information about all weakly connected neural networks, even those that have not been discovered yet. (7 Refs)

Subfile: A C

Descriptors: bifurcation; brain models; neural nets; nonlinear dynamical systems

Identifiers: canonical models; mathematical neuroscience; critical regimes; bifurcations; nonlinear dynamical system theory; brain structures; weakly connected neural networks

Class Codes: A8730 (Biophysics of neurophysiological processes); A0547 (Nonlinear dynamical systems and bifurcations); A8710 (General, theoretical, and mathematical biophysics); C1290L (Systems theory applications in biology and medicine); C1230D (Neural nets)

1/5/24 (Item 24 from file: 2)
DIALOG(R)File 2:INSPEC

5583312 INSPEC Abstract Number: C9706-1230D-200

Title: Canonical models for bifurcations from equilibrium in weakly connected neural networks

Author(s): **Hoppensteadt, F.C.** ; Iahikevich, E.
Author Affiliation: Dept. of Math., Michigan State Univ., East Lansing, MI, USA

Conference Title: WCNN '95. World Congress on Neural Networks. 1995 International Neural Network Society Annual Meeting Part vol.1 p.80-3 vol.1
Publisher: Lawrence Erlbaum Associates, Mahwah, NJ, USA
Publication Date: 1995 Country of Publication: USA 3 vol. (xxxi+xvi+832+1001+273) pp.
ISBN: 0 8058 2125 2 Material Identity Number: XX95-01318
Conference Title: Proceedings of the World Congress on Neural Networks
Conference Sponsor: Int. Neural Network Soc
Conference Date: 17-21 July 1995 Conference Location: Washington, DC, USA

Language: English Document Type: Conference Paper (PA)
Treatment: Practical (P); Theoretical (T)

Abstract: By a weakly connected neural network we mean a dynamical system of the form x/sub i/=f/sub i/(x, lambda)+ epsilon g/sub i/(x/sub 1/, ..., x/sub n/, tau , epsilon), 1<or=y<or=n, (1) where the multidimensional variables x/sub i/, lambda and r are the activity of i/sup th/ neuron, an internal tuning (bifurcation) parameter and an external input parameter, respectively; 0<or= epsilon <<1 is a small parameter, f/sub i/ describes

the dynamics of the i/sup th/ neuron and g/sub i/ describes network properties. If (1) is near a hyperbolic equilibrium, then its dynamics are qualitatively like a linear system. In order to exhibit any interesting nonlinear behavior, the neurons must be near their thresholds. In this case, (1) can exhibit multiple bifurcations, and it can be significantly simplified by reduction to a canonical model, for example to x/sub i/=r/sub i/+b/sub i/x/sub i/+x/sub i//sup 2/+ Sigma /sub j=1//sup k/c/sub ij/x/sub j/, x/sub i/ in R for a multiple fold bifurcation, or to x/sub i/=r/sub i/+b/sub i/x/sub i/+or-x/sub i//sup 3/+ Sigma /sub j=1//sup k/c/sub ij/x/sub j/, x/sub i/ in R for a multiple cusp singularity. (0 Refs)

Subfile: C

Descriptors: bifurcation; neural nets

Identifiers: canonical models; bifurcations; weakly connected neural networks; multidimensional variables; internal tuning parameter; external input parameter; hyperbolic equilibrium; multiple cusp singularity

Class Codes: C1230D (Neural nets)

1/5/25 (Item 25 from file: 2)

DIALOG(R)File 2:INSPEC

5400412 INSPEC Abstract Number: A9623-8730-002, C9612-1290L-002

Title: Synaptic organizations and dynamical properties of weakly connected neural oscillators. II. Learning phase information

Author(s): **Hoppensteadt, F.C.** ; Izhikevich, E.M.

Author Affiliation: Syst. Sci. Center, Arizona State Univ., Tempe, AZ, USA

Journal: Biological Cybernetics vol.75, no.2 p.129-35

Publisher: Springer-Verlag,

Publication Date: Aug. 1996 Country of Publication: Germany

CODEN: BICYAF ISSN: 0340-1200

SICI: 0340-1200(199608)75:2L.129:SODP;1-U

Material Identity Number: B169-96008

Language: English Document Type: Journal Paper (JP)

Treatment: Theoretical (T)

Abstract: For pt. I see ibid., vol. 75, no. 2, p. 117-27 (1996). This is the second of two articles devoted to analyzing the relationship between synaptic organizations (anatomy) and dynamical properties (function) of networks of neural oscillators near multiple supercritical Andronov-Hopf bifurcation points. Here the authors analyze learning processes in such networks. Regarding learning dynamics, the authors assume: (1) learning is local (i.e. synaptic modification depends on pre- and postsynaptic neurons but not on others); (2) synapses modify slowly relative to characteristic neuron response times; and (3) in the absence of either pre- or postsynaptic activity, the synapse weakens (forgets). The authors' major goal is to analyze all synaptic organizations of oscillatory neural networks that can memorize and retrieve phase information or time delays. They show that such networks have the following attributes: (1) the rate of synaptic plasticity connected with learning is determined locally by the presynaptic neurons; (2) the excitatory neurons must be long-axon relay neurons capable of forming distant connections with other excitatory and inhibitory neurons; and (3) if inhibitory neurons have long axons, then the network can learn, passively forget and actively unlearn information by adjusting synaptic plasticity rates. (8 Refs)

Subfile: A C

Descriptors: brain models; learning systems; neural nets; neurophysiology ; oscillators

Identifiers: weakly connected neural oscillators; phase information learning; multiple supercritical Andronov-Hopf bifurcation points; learning dynamics; learning processes; characteristic neuron response times; oscillatory neural networks; time delays; memorization; synaptic plasticity ; long-axon relay neurons; passive forgetting; actively unlearning information; synaptic plasticity rates

Class Codes: A8730E (External and internal data communications, nerve conduction and synaptic transmission); A8710 (General, theoretical, and

mathematical biophysics); A8730G (Memory storage and memorization (biophysical and biochemical processes)); C1290L (Systems theory applications in biology and medicine); C1230D (Neural nets); C1220 (Simulation, modelling and identification)

1/5/26 (Item 26 from file: 2)
DIALOG(R)File 2:INSPEC

5400411 INSPEC Abstract Number: A9623-8730-001, C9612-1290L-001
Title: Synaptic organizations and dynamical properties of weakly connected neural oscillators. I. Analysis of a canonical model
Author(s): **Hoppensteadt, F.C.** ; Izhikevich, E.M.
Author Affiliation: Syst. Sci. Center, Arizona State Univ., Tempe, AZ, USA
Journal: Biological Cybernetics vol.75, no.2 p.117-27
Publisher: Springer-Verlag,
Publication Date: Aug. 1996 Country of Publication: Germany
CODEN: BICYAF ISSN: 0340-1200
SICI: 0340-1200(199608)75:2L.117:SODP;1-0
Material Identity Number: B169-96008
Language: English Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Abstract: The authors study weakly connected networks of neural oscillators near multiple Andronov-Hopf bifurcation points. They analyze relationships between synaptic organizations (anatomy) of the networks and their dynamical properties (function). The authors' principal assumptions are: (1) each neural oscillator comprises two populations of neurons: excitatory and inhibitory ones; (2) activity of each population of neurons is described by a scalar (one-dimensional) variable; (3) each neural oscillator is near a nondegenerate supercritical Andronov-Hopf bifurcation point; (4) the synaptic connections between the neural oscillators are weak. All neural networks satisfying these hypotheses are governed by the same dynamical system, which the authors call the canonical model. Studying the canonical model shows that: (1) A neural oscillator can communicate only with those oscillators which have roughly the same natural frequency. That is, synaptic connections between a pair of oscillators having different natural frequencies are functionally insignificant. (2) Two neural oscillators having the same natural frequencies might not communicate if the connections between them are from among a class of pathological synaptic configurations. In both cases the anatomical presence of synaptic connections between neural oscillators does not necessarily guarantee that the connections are functionally significant. (3) There can be substantial phase differences (time delays) between the neural oscillators, which result from the synaptic organization of the network, not from the transmission delays. Using the canonical model the authors can illustrate self-ignition and autonomous quiescence (oscillator death) phenomena. That is, a network of passive elements can exhibit active properties and vice versa. The authors also study how Dale's principle affects dynamics of the networks, in particular, the phase differences that the network can reproduce. The authors present a complete classification of all possible synaptic organizations from this point of view. The theory developed here casts some light on relations between synaptic organization and functional properties of oscillatory networks. The major advantage of the authors' approach is that they obtain results about all networks of neural oscillators, including the real brain. The major drawback is that the authors' findings are valid only when the brain operates near a critical regime, viz. for a multiple Andronov-Hopf bifurcation. (32 Refs)
Subfile: A C
Descriptors: brain models; neural nets; neurophysiology; oscillators
Identifiers: synaptic organizations; dynamical properties; weakly connected neural oscillators; canonical model analysis; multiple Andronov-Hopf bifurcation points; excitatory neurons; inhibitory neurons; natural frequency; synaptic connections; Dale's principle; passive elements network; autonomous quiescence

Class Codes: A8730E (External and internal data communications, nerve conduction and synaptic transmission); A8710 (General, theoretical, and mathematical biophysics); C1290L (Systems theory applications in biology and medicine); C1220 (Simulation, modelling and identification); C1230D (Neural nets)

1/5/27 (Item 27 from file: 2)

DIALOG(R)File 2:INSPEC

03820884 INSPEC Abstract Number: B91008122, C91018590

Title: Computer simulation of a neural prism

Author(s): **Hoppensteadt, F.C.**

Author Affiliation: Dept. of Math., Michigan State Univ., East Lansing, MI, USA

Conference Title: Proceedings of the 32nd Midwest Symposium on Circuits and Systems (Cat. No.89CH2785-4) p.238-9 vol.1

Publisher: IEEE, New York, NY, USA

Publication Date: 1990 Country of Publication: USA 2 vol. 1266 pp.

U.S. Copyright Clearance Center Code: CH2785-4/90/0000-0238$01.00

Conference Sponsor: IEEE; Univ. Illinois at Urbana-Champaign

Conference Date: 14-16 Aug. 1989 Conference Location: Champaign, IL, USA

Language: English Document Type: Conference Paper (PA)

Treatment: Practical (P)

Abstract: A network of voltage-controlled oscillator neuron (VCON) models is formed by a gradient of negative feedbacks, similar to a gradient of inhibitory connections in a neural system. A network of this kind is called a prism. Computer simulation notation to describe all the variables in the network is introduced. Computer simulation of the network shows that a smooth gradient of output frequencies results from monochromatic stimulation. (2 Refs)

Subfile: B C

Descriptors: digital simulation; feedback; neural nets; variable-frequency oscillators

Identifiers: computer simulation; neural prism; voltage-controlled oscillator neuron; gradient; negative feedbacks; inhibitory connections; output frequencies; monochromatic stimulation

Class Codes: B1230B (Oscillators); B1130B (Computer-aided circuit analysis and design); C7410D (Electronic engineering); C5160 (Analogue circuits); C1230 (Artificial intelligence)

1/5/28 (Item 28 from file: 2)

DIALOG(R)File 2:INSPEC

02204150 INSPEC Abstract Number: B84013314, C84012282

Title: An extrapolation method for the numerical solution of singular perturbation problems

Author(s): **Hoppensteadt, F.C.** ; Miranker, W.L.

Author Affiliation: Dept. of Math., Univ. of Utah, Salt Lake City, UT, USA

Journal: SIAM Journal on Scientific and Statistical Computing vol.4, no.4 p.612-25

Publication Date: Dec. 1983 Country of Publication: USA

CODEN: SIJCD4 ISSN: 0196-5204

U.S. Copyright Clearance Center Code: 0196-5204/83/0404-0004$01.25/0

Language: English Document Type: Journal Paper (JP)

Treatment: Theoretical (T)

Abstract: The authors show how the form of the perturbation approximation for the solution of stiff systems of ordinary differential equations with an identifiable small parameter can be used to generate associated nonstiff or relaxed equations. Solutions of these relaxed equations are easily calculated and appropriate combinations of these solutions furnish

numerical approximations to the original stiff problem. Variations of this method are applied to two classes of initial value problems: those with highly oscillatory solutions and those with rapidly equilibrating solutions. (7 Refs)
Subfile: B C
Descriptors: differential equations; extrapolation; initial value problems; perturbation techniques
Identifiers: extrapolation method; numerical solution; singular perturbation problems; stiff systems; ordinary differential equations; relaxed equations; numerical approximations; initial value problems
Class Codes: B0290F (Interpolation and function approximation); B0290P (Differential equations); C4130 (Interpolation and function approximation); C4170 (Differential equations)

1/5/29 (Item 29 from file: 2)
DIALOG(R)File 2:INSPEC

02144080 INSPEC Abstract Number: B83059160, C83041407
Title: An algorithm for approximate solutions to weakly filtered synchronous control systems and nonlinear renewal processes
Author(s): **Hoppensteadt, F.C.**
Author Affiliation: Dept. of Math., Univ. of Utah, Salt Lake City, UT, USA
Journal: SIAM Journal on Applied Mathematics vol.43, no.4 p.834-43
Publication Date: Aug. 1983 Country of Publication: USA
CODEN: SMJMAP ISSN: 0036-1399
U.S. Copyright Clearance Center Code: 0036-1399/83/4304-0012$01.25/0
Language: English Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Abstract: A multi-time perturbation algorithm is derived to study certain synchronous control systems and nonlinear renewal processes. The new methods presented study singular perturbation problems or nonlinear Volterra integro-differential equations whose kernels are close to the Dirac delta function. The algorithm provides useful approximate solutions to weakly filtered phase-locked loop circuits and to nonlinear renewal equations describing certain population dynamics. (11 Refs)
Subfile: B C
Descriptors: control theory; demography; ecology; feedback; integro-differential equations; nonlinear differential equations; perturbation techniques; phase-locked loops
Identifiers: multitime perturbation algorithm; nonlinear Volterra integrodifferential equations; algorithm; weakly filtered synchronous control systems; nonlinear renewal processes; certain synchronous control systems; nonlinear renewal processes; Dirac delta function; filtered phase-locked loop circuits; nonlinear renewal equations; population dynamics
Class Codes: B0220 (Analysis); B1160 (Nonlinear network analysis and design); B1250 (Modulators, demodulators, discriminators and mixers); C1120 (Analysis); C1290B (Natural resources and ecology); C1300 (Control theory)

1/5/30 (Item 30 from file: 2)
DIALOG(R)File 2:INSPEC

01723009 INSPEC Abstract Number: C81025330
Title: Threshold analysis of a drug use epidemic model
Author(s): **Hoppensteadt, F.C.** ; Murray, J.D.
Author Affiliation: Dept. of Math., Univ. of Utah, Salt Lake City, UT, USA
Journal: Mathematical Biosciences vol.53, no.1-2 p.79-87
Publication Date: Feb. 1981 Country of Publication: USA
CODEN: MABIAR ISSN: 0025-5564
Language: English Document Type: Journal Paper (JP)

Treatment: Theoretical (T)

Abstract: A model of an individual's response to a drug is formulated. This is based on interaction between applied dosage of the drug and active and inactive receptor sites in the body. A population of such individuals is considered. These are divided among nonusers (susceptibles), active users, and individuals removed through treatment and cure, disenchantment, etc. Recruitment of susceptibles to active drug use is assumed to occur through contact with active users, and the effectiveness of recruitment (or infectiousness) depends on the age of a user. The model is based solely on the user's response to the drug, and it is shown that when a certain combination of susceptible population size, individual susceptibility, and infectiousness does not exceed a critical threshold value, there will be only few users. But when the threshold value is exceeded, an epidemic of drug use ensues. (2 Refs)

Subfile: C

Descriptors: biocybernetics

Identifiers: epidemic model; applied dosage; receptor sites; response; susceptible population size; individual susceptibility; infectiousness; threshold analysis

Class Codes: C1290L (Biology and medicine)

1/5/31 (Item 31 from file: 2)

DIALOG(R)File 2:INSPEC

01329854 INSPEC Abstract Number: A79028481, B79017828

Title: Dynamics of the Josephson junction

Author(s): Levi, M.; **Hoppensteadt, F.C.** ; Miranker, W.L.

Author Affiliation: Courant Inst., New York Univ., New York, NY, USA

Journal: Quarterly of Applied Mathematics vol.36, no.2 p.167-98

Publication Date: July 1978 Country of Publication: USA

CODEN: QAMAAY ISSN: 0033-569X

Language: English Document Type: Journal Paper (JP)

Treatment: Theoretical (T)

Abstract: The sine-Gordon equation and systems of discrete approximations to it which are respectively a model of the Josephson junction and models of coupled-point Josephson junctions are studied. This is done in the so-called current-driven case. The voltage response of these devices is the average of the time derivative of the solution of these equations and the authors demonstrate the existence of running periodic solutions for which the average exists. Static solutions are also studied. These together with the running solutions explain the multiple-valuedness in the response of a Josephson junction in several cases. The stability of the various solutions is described in some of the cases. Numerical results are displayed which give details of structure of solution types in the case of a single point junction and of the one-dimensional distributed junction. (10 Refs)

Subfile: A B

Descriptors: Josephson effect; nonlinear differential equations; superconducting junction devices

Identifiers: Josephson junction; running periodic solutions; sine Gordon equation

Class Codes: A7450 (Proximity effects, tunnelling phenomena, and Josephson effect); B3240C (Superconducting junction devices)

1/5/32 (Item 32 from file: 2)

DIALOG(R)File 2:INSPEC

01219167 INSPEC Abstract Number: A78057794, B78032418

Title: Frequency entrainment of a forced van der Pol oscillator

Author(s): Flaherty, J.E.; **Hoppensteadt, F.C.**

Author Affiliation: Rensselaer Polytech. Inst., Troy, NY, USA

Journal: Studies in Applied Mathematics vol.58, no.1 p.5-15

Publication Date: Jan. 1978 Country of Publication: USA

CODEN: SAPMB6 ISSN: 0022-2526

Language: English Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Abstract: A van der Pol relaxation oscillator that is subjected to external sinusoidal forcing can exhibit stable and unstable periodic and almost periodic responses. For some forcing amplitudes it even happens that two stable subharmonics having different periods may coexist. The stable responses of such forced oscillators are investigated here. By numerically computing the rotation number of stable oscillations for various values of the forcing amplitude and oscillator tuning, descriptions are obtained of regions of phase locking, successive bifurcation of stable subharmonic and almost periodic oscillations, and overlap regions where two distinct stable oscillations can coexist. (16 Refs)
Subfile: A B
Descriptors: nonlinear differential equations; oscillations; relaxation oscillators; wave equations
Identifiers: van der Pol relaxation oscillator; external sinusoidal forcing; forcing amplitudes; stable subharmonics; rotation number; oscillator tuning; phase locking; successive bifurcation; overlap regions; stable periodic responses; unstable periodic responses
Class Codes: A0230 (Function theory, analysis); A0340K (Waves and wave propagation: general mathematical aspects); B0290P (Differential equations)

1/5/33 (Item 33 from file: 2)
DIALOG(R)File 2:INSPEC

01210560 INSPEC Abstract Number: C78016337
Title: Optimal exploitation of a spatially distributed fishery
Author(s): **Hoppensteadt, F.C.**
Author Affiliation: Courant Inst. of Math. Sci., New York Univ., New York, NY, USA
Conference Title: International Symposium on New Trends in Systems Analysis p.3-18
Editor(s): Bensoussan, A.; Lions, J.L.
Publisher: Springer-Verlag, Berlin, West Germany
Publication Date: 1977 Country of Publication: West Germany vii+759 pp.
ISBN: 3 540 08406 1
Conference Sponsor: IIASA; IFAC; et al
Conference Date: 13-17 Dec. 1976 Conference Location: Versailles, France
Language: English Document Type: Conference Paper (PA)
Treatment: Theoretical (T)
Abstract: Exploitation of a fish population distributed in a habitat bounded on one side by a breeding ground and on the other by an unfavorable environment is studied. The population's dynamics on the breeding grounds are assumed to be described by a simple depensatory function. The effects on this population of harvesting by a fishing fleet are determined as maximum effort and harvesting quotas are varied. In particular, threshold values for these parameters are derived beyond which an open access fishery collapses. Competition with an external fleet and dynamic optimisation are discussed briefly. (2 Refs)
Subfile: C
Descriptors: distributed parameter systems; ecology; optimisation
Identifiers: spatially distributed fishery; fish population; depensatory function; harvesting; threshold values; dynamic optimisation; population dynamics
Class Codes: C1180 (Optimisation techniques); C1290B (Natural resources and ecology)

1/5/34 (Item 34 from file: 2)
DIALOG(R)File 2:INSPEC

01151335 INSPEC Abstract Number: A78016758

Title: Slowly modulated oscillations in nonlinear diffusion processes
Author(s): Cohen, D.S.; **Hoppensteadt, F.C.** ; Miura, R.M.
Author Affiliation: Dept. of Appl. Math., California Inst. of Technol., Pasadena, CA, USA
Journal: SIAM Journal on Applied Mathematics vol.33, no.2 p.217-29
Publication Date: Sept. 1977 Country of Publication: USA
CODEN: SMJMAP ISSN: 0036-1399
Language: English Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Abstract: It is shown here that certain systems of nonlinear (parabolic) reaction-diffusion equations have solutions which are approximated by oscillatory functions in the form R(xi -c tau)P(t*) where P(t*) represents a sinusoidal oscillation on a fast time scale t* and R(xi -c tau) represents a slowly-varying modulating amplitude on slow space (xi) and slow time (tau) scales. Such solutions describe phenomena in chemical reactors, chemical and biological reactions, and in other media where a stable oscillation at each point (or site) undergoes a slow amplitude change due to diffusion. (19 Refs)
Subfile: A
Descriptors: diffusion; oscillations
Identifiers: nonlinear diffusion processes; slowly modulated oscillations
Class Codes: A0560 (Transport processes: theory)

1/5/35 (Item 35 from file: 2)
DIALOG(R)File 2:INSPEC

00808356 INSPEC Abstract Number: B75032282, C75020290
Title: Asymptotic behavior of solutions to a population equation
Author(s): Greenberg, J.M.; **Hoppensteadt, F.**
Author Affiliation: Courant Inst. of Math. Sci., New York Univ., NY, USA
Journal: SIAM Journal on Applied Mathematics vol.28, no.3 p.662-74
Publication Date: May 1975 Country of Publication: USA
CODEN: SMJMAP ISSN: 0036-1399
Language: English Document Type: Journal Paper (JP)
Treatment: Theoretical (T)
Abstract: Studies the large time behavior of solutions x(t) to the nonlinear equation x(t)= gamma integral /sub t-1//sup t/x(eta)(1-x(eta))d eta which satisfy 0<or=x(t)<or=1. It is known that such solutions approach constants as t to infinity . The authors investigate the way in which the limit is attained. For 0<or= gamma <or=3, the convergence is dominated by iterates of a quadratic polynomial. For gamma >>1, a multitime perturbation expansion is derived for the solution. The leading coefficient satisfies Burgers' equation with periodic boundary conditions and the higher order coefficients are determined as solutions of a linear heat equation with periodic boundary conditions. (3 Refs)
Subfile: B C
Descriptors: integral equations; nonlinear equations
Identifiers: asymptotic behaviour; integral; population equation; large time behaviour of solutions; nonlinear equation; quadratic polynomial; multitime perturbation expansion; Burgers' equation; periodic boundary conditions; linear heat equation
Class Codes: B0220 (Analysis); C1120 (Analysis)

1/5/36 (Item 36 from file: 2)
DIALOG(R)File 2:INSPEC

00708008 INSPEC Abstract Number: C75000245
Title: An age dependent epidemic model
Author(s): **Hoppensteadt, F.**
Author Affiliation: Courant Inst. Mathematical Sci., NY, USA
Journal: Journal of the Franklin Institute vol.297, no.5 p.325-33
Publication Date: May 1974 Country of Publication: UK
CODEN: JFINAB ISSN: 0016-0032

Language: English   Document Type: Journal Paper (JP)
Treatment: Applications (A); Theoretical (T)
Abstract: The model presented describes the spread of an infection in a population by keeping track of the chronological ages of the participants as well as their 'class ages', (i.e. the length of time since entering their present state). The reasoning behind this model is similar to that used in the equation of age dependent population growth. (7 Refs)
Subfile: C
Descriptors: biocybernetics; medicine; modelling
Identifiers: age dependent; epidemic model; spread of infection; chronological ages; class edges
Class Codes: C1290L (Biology and medicine); C7330 (Biology and medicine)

1/5/37 (Item 37 from file: 2)
DIALOG(R)File 2:INSPEC

00322207 INSPEC Abstract Number: C71022749
Title: Structure of decaying solutions of singular perturbation problems
Author(s): **Hoppensteadt, F.**
Author Affiliation: New York Univ., NY, USA
Conference Title: Proceedings of the 8th annual Allerton conference on circuit and system theory p.303-9
Publisher: IEEE, New York, NY, USA
Publication Date: 1970 Country of Publication: USA xii+657 pp.
Conference Sponsor: Univ. Illinois, Dept. Elect. Engng., Co-ordinated Sci. Lab., IEEE, Groups on Circuit Theory and Automatic Control
Conference Date: 7-9 Oct. 1970 Conference Location: Monticello, IL, USA
Language: English Document Type: Conference Paper (PA)
Treatment: Theoretical (T)
Abstract: Systems of the form dx/dt=f(t,x,y, epsilon), epsilon dy/dt=g(t,x,y, epsilon) are considered. This paper studies conditions under which the solution of the initial value problem associated with this system can be written as (x(tau , epsilon), y*(t, epsilon)) + (X(tau , epsilon), Y(tau , epsilon)) where (x*,y*) is a solution of the system which is smooth at epsilon =0 and (X,Y) is an exponentially decaying function of tau =t. epsilon as tau to infinity .
Subfile: C
Descriptors: perturbation techniques
Identifiers: singular perturbation problems; decaying solutions structure
Class Codes: C1320 (Stability)

1/5/38 (Item 1 from file: 6)
DIALOG(R)File 6:NTIS

0748018 NTIS Accession Number: AD-A063 439/4/XAB
Differential Equations Having Rapidly Changing Solutions: Analytic Methods for Weakly Nonlinear Systems
Hoppensteadt, F. C. ; Miranker, W. L.
New York Univ NY Courant Inst of Mathematical Sciences
Corp. Source Codes: 099950
Sponsor: Army Research Office, Research Triangle Park, NC
Report No.: ARO-12387.3-M
31 Dec 74 14p
Languages: English Document Type: Journal article
Journal Announcement: GRAI7911
Prepared in cooperation with IBM Thomas J. Watson Research Center, Yorktown Heights, N.Y.
Pub. in Jnl. of Differential Equations, v22 n2 p237-249 Nov 76. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)321-8547; and email at orders@ntis.fedworld.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.

NTIS Prices: PC A02/MF A01
Contract No.: DAAG29-74-G-0219
No abstract available.
Descriptors: *Nonlinear differential equations; Boundary value problems; Approximation(Mathematics); Reprints
Identifiers: NTISDODXR; NTISDODA
Section Headings: 72B (Mathematical Sciences--Algebra, Analysis, Geometry, and Mathematical Logic)

1/5/39 (Item 2 from file: 6)
DIALOG(R)File 6:NTIS

0705295 NTIS Accession Number: AD-A054 840/4/XAB
Slowly Modulated Oscillations in Nonlinear Diffusion Processes
Cohen, D. S. ; **Hoppensteadt, F. C.** ; Miura, R. M.
California Inst of Tech Pasadena Dept of Applied Mathematics
Corp. Source Codes: 407249
Report No.: AFOSR-TR-78-0498
11 Feb 76 14p
Document Type: Journal article
Journal Announcement: GRAI7818
Pub. in SIAM Jnl. of Applied Mathematics, v33 n2 p217-229 Sep 77. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)321-8547; and email at orders@ntis.fedworld.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
NTIS Prices: PC A02/MF A01
Contract No.: DAHC04-68-C-0006; AFOSR-71-2107; 2304; A4
No abstract available.
Descriptors: *Diffusion theory; *Chemical reactors; Oscillation; Reaction kinetics; Nonlinear differential equations; Reprints
Identifiers: NTISDODXR
Section Headings: 99F (Chemistry--Physical and Theoretical Chemistry)

1/5/40 (Item 3 from file: 6)
DIALOG(R)File 6:NTIS

0677390 NTIS Accession Number: AD-A049 295/9/XAB
Nonlinear Phenomena in Electromagnetic Theory and Acoustics
(Final rept. 1 Jun 74-30 Sep 77)
Keller, J. B. ; **Hoppensteadt, F. C.**
New York Univ N Y Courant Inst of Mathematical Sciences
Corp. Source Codes: 099950
Report No.: ARO-12387.4-M
Jan 78 28p
Journal Announcement: GRAI7808
Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)321-8547; and email at orders@ntis.fedworld.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
NTIS Prices: PC A03/MF A01
Contract No.: DAAG29-74-G-0219
The research projects supported by these grants include investigations into problems of nonlinear wave propagation, nonlinear electrical circuits, propagation in wave guides, thermal convection and continuum mechanics. The success of these projects rested on our unified and coherent development and applications of multi-scale perturbation methods to study the complicated nonlinear systems which describe these physical phenomena. The research projects are described in forty-seven research papers and books. These are summarized in this report by area of application. (Author)
Descriptors: *Electromagnetic wave propagation; *Nonlinear propagation analyses; *Perturbation theory; *Acoustic waves; Waveguides; Circuit analysis; Stochastic processes; Sound transmission; Continuum mechanics;

Asymptotic series; Boundary value problems; Convection(Heat transfer); Literature surveys; Abstracts
Identifiers: Bifurcation theory; Nonlinear acoustics; NTISDODXA
Section Headings: 46H (Physics--Radiofrequency Waves); 46A (Physics--Acoustics)

1/5/41 (Item 4 from file: 6)
DIALOG(R)File 6:NTIS

0631287 NTIS Accession Number: AD-A039 211/8/XAB
Frequency Entrainment of a Forced Van Der Pol Oscillator
(Interim rept)
Flaherty, J. E. ; **Hoppensteadt, F. C.**
Rensselaer Polytechnic Inst Troy N Y Dept of Mathematical Sciences
Corp. Source Codes: 408898
Report No.: AFOSR-TR-77-0615
Apr 77 25p
Journal Announcement: GRAI7715
Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)321-8547; and email at orders@ntis.fedworld.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
NTIS Prices: PC A02/MF A01
Contract No.: AF-AFOSR-2818-75; DAAG29-74-G-0219; 2304; A3
A Van der Pol relaxation oscillator that is subjected to external sinusoidal forcing can exhibit stable and unstable periodic and almost periodic responses. For some forcing amplitudes it even happens that two stable subharmonics having different periods may coexist. The stable responses of such forced oscillators are investigated. By numerically computing the rotation number of stable oscillations for various values of the forcing amplitude and oscillator tuning, descriptions are obtained of regions of phase locking, successive bifurcation of stable subharmonic and almost periodic oscillations, and overlap regions where two distinct stable oscillations can coexist.
Descriptors: *Relaxation oscillators; Oscillation; Phase locked systems
Identifiers: Frequency entrainment; Van der Pol oscillators; NTISDODXA
Section Headings: 49B (Electrotechnology--Circuits)

1/5/42 (Item 5 from file: 6)
DIALOG(R)File 6:NTIS

0610876 NTIS Accession Number: AD-A035 784/8/XAB
A Nonlinear Renewal Equation with Periodic and Chaotic Solutions
Hoppensteadt, F. C.
New York Univ N Y Courant Inst of Mathematical Sciences
Corp. Source Codes: 099950
Report No.: ARO-12387.2-M
1976 12p
Document Type: Journal article
Journal Announcement: GRAI7709
Pub. in SIAM-AMS Proceedings, v10 p51-60 1976. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)321-8547; and email at orders@ntis.fedworld.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
NTIS Prices: PC A02/MF A01
Contract No.: DAAG29-74-G-0219
A nonlinear renewal equation which arises in several areas of mathematical population theory is studied by a combination of mathematical and numerical analysis. The model is characterized by two parameters: m, a measure of the population's viability and fertility, and micron, the (normalized) length of the population's reproductive window.
Descriptors: *Population(Mathematics); Numerical analysis; Nonlinear analysis; Perturbations; Reprints

Identifiers: Chaotic solutions; NTISDODXR
Section Headings: 72F (Mathematical Sciences--Statistical Analysis)

1/5/43 (Item 6 from file: 6)
DIALOG(R)File 6:NTIS

0525394 NTIS Accession Number: AD-A017 259/3/XAB
Nonlinear Stability Analysis of Static States which Arise through Bifurcation
Hoppensteadt, F. ; Gordon, N.
New York Univ N Y Courant Inst of Mathematical Sciences
Corp. Source Codes: 099950
Sponsor: Army Research Office, Durham, N.C.
Nov 74 20p
Document Type: Journal article
Journal Announcement: GRAI7601
Pub. in Communications on Pure and Applied Mathematics, v28 p355-373 1975. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)321-8547; and email at orders@ntis.fedworld.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
NTIS Prices: PC A02/MF A01
Contract No.: DAHC04-74-G-0219
No abstract available.
Descriptors: *Nonlinear systems; *Functions(Mathematics); *Theorems; Stability; Static tests; Operators(Mathematics); Solutions(General); Projection; Reprints
Identifiers: Bifurcation; Projection operators; NTISDODXR; NTISDODA
Section Headings: 72B (Mathematical Sciences--Algebra, Analysis, Geometry, and Mathematical Logic)

1/5/44 (Item 7 from file: 6)
DIALOG(R)File 6:NTIS

0496037 NTIS Accession Number: AD-A009 029/0/XAB
Analysis of Some Problems Having Matched Asymptotic Expansion Solutions
Hoppensteadt, F.
New York Univ N Y Courant Inst of Mathematical Sciences
Corp. Source Codes: 099950
Sponsor: Office of Naval Research, Arlington, Va.
Report No.: SI-16
30 Apr 74 15p
Document Type: Journal article
Journal Announcement: GRAI7513
Presented at the Special Session of Asymptotic and Perturbation Methods in Fluid Mechanics and Wave Propagation, AMS Summer Meeting, 1972, Dartmouth Coll., Hanover, N. H.
Pub. in SIAM Review, v17 n1 p123-135 Jan 75. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)321-8547; and email at orders@ntis.fedworld.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
NTIS Prices: PC A02/MF A01
Contract No.: N00014-67-A-0467-0027; NR-041-427
Several examples are presented which illustrate some capabilities and some limitations of the method of matched asymptotic expansions for solving evolution equations. The results are listed according to spectral properties of the linear problem resulting near a known steady state of the system. When the linear problem is stable, it is shown that the solution can be written as a (finite) sum of terms, each responding on a different time scale. When the linear problem is unstable, it is shown that the method can be used to determine initial data which excite only decaying modes, and, in the case of bifurcation of new steady states, to construct the new states as well as the transients to them. (Author)

Descriptors: *Asymptotic series; *Fluid mechanics; Incompressible flow; Perturbation theory; Mathematical models; Stability; Reprints
Identifiers: NTISDODN
Section Headings: 72B (Mathematical Sciences--Algebra, Analysis, Geometry, and Mathematical Logic)

1/5/45 (Item 8 from file: 6)
DIALOG(R)File 6:NTIS

0463765 NTIS Accession Number: AD-786 088/5/XAB
Asymptotic Stability in Singular Perturbation Problems. II. Problems Having Matched Asymptotic Expansion Solutions
Hoppensteadt, F.
New York Univ.N.Y. Courant Inst of Mathematical Sciences
Corp. Source Codes: 099950
Sponsor: Army Research Office, Durham, N.C.
Report No.: AROD-5669.30-M
15 Feb 73 14p
Document Type: Journal article
Journal Announcement: GRAI7424
Pub. in Jnl. of Differential Equations, v15 n3 p510-521 May 74. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)321-8547; and email at orders@ntis.fedworld.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
NTIS Prices: PC E99/MF E99
Contract No.: DA-ARO-D-31-124-72-G47
The stability of systems of ordinary differential equations of the form dx/dt = f(t,x,y,epsilon), epsilon dy/dt = g(t,x,y,epsilon), where epsilon is a real parameter near zero, is studied. It is shown that if the reduced problem dx/dt = f(t,s,y,O), O = g(t,x,y,O), is stable, and certain other conditions which ensure that the method of matched asymptotic expansions can be used to construct solutions are satisfied, then the full problem is asymptotically stable as t nears infinity, and a domain of stability is determined which is independent of epsilon. (Modified author abstract)
Descriptors: *Differential equations; Perturbation theory; Asymptotic series; Theorems; Reprints
Identifiers: Asymptotic stability; NTISDODA
Section Headings: 72B (Mathematical Sciences--Algebra, Analysis, Geometry, and Mathematical Logic)

1/5/46 (Item 9 from file: 6)
DIALOG(R)File 6:NTIS

0420715 NTIS Accession Number: AD-772 172/3/XAB
Justification of Matched Asymptotic Expansion Solutions for Some Singular Perturbation Problems
Hoppensteadt, F.
New York Univ N Y Courant Inst of Mathematical Sciences
Corp. Source Codes: 099950
Report No.: AROD-5669.24-M
1973 8p
Document Type: Journal article
Journal Announcement: GRAI7405
Pub. in Unidentified Jnl. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)321-8547; and email at orders@ntis.fedworld.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
NTIS Prices: PC E99/MF E99
Contract No.: DA-ARO-D-31-124-71-G108; DA-2-0-061102-B-14-C
Several types of problems involving non-linear partial differential equations having small parameters are described which are amenable to the method of matched asymptotic expansions. This method gives approximate

solutions to the problems which are valid over large time intervals. This theory is applicable to many problems involving the Navier-Stokes equations and to quite general operator equations. (Author)
Descriptors: *Nonlinear differential equations; *Partial differential equations; *Perturbation theory; *Asymptotic series; Banach space; Boundary value problems; Reprints
Identifiers: Parabolic differential equations; NTISA
Section Headings: 72B (Mathematical Sciences--Algebra, Analysis, Geometry, and Mathematical Logic)

1/5/47 (Item 10 from file: 6)
DIALOG(R)File 6:NTIS

0275017 NTIS Accession Number: AD-725 251/XAB
A Problem in the Theory of Epidemics
Hoppensteadt, F. ; Waltman, P.
New York Univ N Y Courant Inst of Mathematical Sciences
Corp. Source Codes: 099950
Report No.: AFOSR-TR-71-1695
1970 23p
Document Type: Journal article
Journal Announcement: GRAI7115
Prepared in cooperation with Iowa Univ., Iowa City, Grants NSF-GP-8173 and NSF-GP-19617.
Pub. in Mathematical Biosciences, v9 p71-91 1970. Order this product from NTIS by: phone at 1-800-553-NTIS (U.S. customers); (703)605-6000 (other countries); fax at (703)321-8547; and email at orders@ntis.fedworld.gov. NTIS is located at 5285 Port Royal Road, Springfield, VA, 22161, USA.
NTIS Prices: PC E99/MF E99
Contract No.: AF-AFOSR-537-67; AF-9749
The article considers a model for the spread of an infection of the type proposed by K. Cooke. The model involves a threshold for becoming infective that leads to functional, rather than ordinary, differential equations. Three types of result are presented. The principal result is to show that the model yields a mathematically well-posed problem. The existence, uniqueness, and continuous dependence on initial data is demonstrated. Then an approximate solution is obtained for small values of a threshold parameter. Finally, a numerical scheme is proposed for one case. A number of graphs illustrate the effect of varying certain parameters in the model in this case. (Author)
Descriptors: *Epidemiology; Mathematical models; Mathematical analysis; Infections; Population; Exposure; Thresholds(Physiology); Theory; Reprints
Identifiers: *Biomathematics; NTISAF
Section Headings: 57E (Medicine and Biology--Clinical Medicine)

1/5/48 (Item 11 from file: 6)
DIALOG(R)File 6:NTIS

0222855 NTIS Accession Number: AD-704 206/XAB
Asymptotic Series Solutions of Some Nonlinear Parabolic Equations with a Small Parameter
Hoppensteadt, F.
New York Univ N Y Courant Inst of Mathematical Sciences
Corp. Source Codes: 099950
Report No.: AROD-5669:12-M
17 Jun 69 18p
Document Type: Journal article
Journal Announcement: USGRDR7011
Pub. in Archive for Rational Mechanics and Analysis, v35 n4 p284-298 1969.
NTIS Prices: Not available NTIS
Contract No.: DA-31-124-ARO(D)-361; DA-2-O-061102-B-14-C
Consider the initial value problem (1) epsilon (dv)/(dt) + A(t, epsilon)v

= f(t,v, epsilon), v(t sub 0) = v sup 0 where epsilon is a small positive parameter and v is an element of a Banach space E. The linear operators A(t, epsilon) have a common domain of definition which is independent of (t, epsilon), and f(t,v, epsilon) is a power series. The main result of this paper is an expansion for the solution of (1) which is valid as epsilon yield 0. We will show that several of the methods developed for studying problems of this kind for ordinary differential equations (A(t, epsilon) bounded operators) can be extended and applied to the study of (1).

Descriptors: *Partial differential equations; *Nonlinear differential equations; *Asymptotic series; Banach space; Initial value problems; Groups(Mathematics); Theorems; Reprints

Identifiers: Parabolic differential equations; Semigroup theory

Section Headings: 72GE (Mathematical Sciences--General)

1/5/49 (Item 12 from file: 6)

DIALOG(R)File 6:NTIS

0110647 NTIS Accession Number: AD-644 040/XAB

Singular Perturbations on the Infinite Interval

(Revised ed)

Hoppensteadt, F. C.

Michigan State Univ., East Lansing.

Corp. Source Codes: 228500

Report No.: AROD-3508:2

13 Jan 66 16p

Document Type: Journal article

Journal Announcement: USGRDR6701; D6703

Doctoral thesis. Revision of manuscript submitted 4 Oct 65.

Published in Transactions of the American Mathematical Society v123 n2 p521-35 Jun 1966.

NTIS Prices: Not available NTIS

Contract No.: DA-31-124-ARO(D)-268

The result of this paper is the best possible in the sense that the hypotheses cannot be substantially weakened. A series of examples accompanying the theorem investigates the possibility of altering the hypotheses.

Descriptors: *Perturbation theory; *Initial value problems; Functions; Matrix algebra; Complex variables; Stability; Boundary layer; Reprints

1/5/50 (Item 1 from file: 8)

DIALOG(R)File 8:Ei Compendex(R)

08512410 E.I. No: EIP01045592928

Title: Synchronization of MEMS resonators and mechanical neurocomputing

Author: **Hoppensteadt, Frank C.** ; Izhikevich, Eugene M.

Corporate Source: Arizona State Univ, Tempe, AZ, USA

Source: IEEE Transactions on Circuits and Systems I: Fundamental Theory and Applications v 48 n 2 Feb 2001. p 133-138

Publication Year: 2001

CODEN: ITCAEX ISSN: 1057-7122

Language: English

Document Type: JA; (Journal Article) Treatment: T; (Theoretical)

Journal Announcement: 0105W1

Abstract: We combine here two well-known and established concepts: microelectromechanical systems (MEMS) and neurocomputing. First, we consider MEMS oscillators having low amplitude activity and we derive a simple mathematical model that describes nonlinear phase-locking dynamics in them. Then, we investigate a theoretical possibility of using MEMS oscillators to build an oscillatory neurocomputer having autocorrelative associative memory. The neurocomputer stores and retrieves complex oscillatory patterns in the form of synchronized states with appropriate phase relations between the oscillators. Thus, we show that MEMS alone can

be used to build a sophisticated information processing system (U.S. provisional patent 60/178,654). (Author abstract) 19 Refs.
Descriptors: *Microelectromechanical devices; Synchronization; Resonators ; Neural networks; Associative storage; Mathematical models; Bifurcation (mathematics)
Identifiers: Mechanical neurocomputing; Nonlinear phase-locking; Oscillatory patterns
Classification Codes:
704.1 (Electric Components); 732.1 (Control Equipment); 731.1 (Control Systems); 723.4 (Artificial Intelligence); 722.1 (Data Storage, Equipment & Techniques)
704 (Electric Components & Equipment); 732 (Control Devices); 731 (Automatic Control Principles); 723 (Computer Software); 722 (Computer Hardware); 921 (Applied Mathematics)
70 (ELECTRICAL ENGINEERING); 73 (CONTROL ENGINEERING); 72 (COMPUTERS & DATA PROCESSING); 92 (ENGINEERING MATHEMATICS)

1/5/51 (Item 2 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

07051434 E.I. No: EIP04408393803
Title: Oscillatory associative memory network with perfect retrieval
Author: Nishikawa, Takashi; **Hoppensteadt, Frank C.** ; Lai, Ying-Cheng
Corporate Source: Department of Mathematics Ctr. for Syst. Sci./Eng. Research Arizona State University, Tempe, AZ 85287, United States
Source: Physica D: Nonlinear Phenomena v 197 n 1 Oct 1 2004. p 134-148
Publication Year: 2004
CODEN: PDNPDT ISSN: 0167-2789
Language: English
Document Type: JA; (Journal Article) Treatment: T; (Theoretical)
Journal Announcement: 0410W2
Abstract: Inspired by the discovery of possible roles of synchronization of oscillations in the brain, networks of coupled phase oscillators have been proposed before as models of associative memory based on the concept of temporal coding of information. Here we show, however, that error-free retrieval states of such networks turn out to be typically unstable regardless of the network size, in contrast to the classical Hopfield model. We propose a remedy for this undesirable property, and provide a systematic study of the improved model. In particular, we show that the error-free capacity of the network is at least 2epsilon**2 / log n patterns per neuron, where n is the number of oscillators (neurons) and epsilon the strength of the second-order mode in the coupling function. copy 2004 Elsevier B.V. All rights reserved. 22 Refs.
Descriptors: *Storage allocation (computer); Oscillations; Synchronization; Neural networks; Random processes; Error analysis; Matrix algebra; Functions
Identifiers: Phase oscillators; Random matrices; Memory network; Hopfield model
Classification Codes:
722.1 (Data Storage, Equipment & Techniques); 931.1 (Mechanics); 731.1 (Control Systems); 723.4 (Artificial Intelligence); 922.1 (Probability Theory); 921.6 (Numerical Methods); 921.1 (Algebra)
722 (Computer Hardware); 931 (Applied Physics Generally); 731 (Automatic Control Principles & Applications); 723 (Computer Software, Data Handling & Applications); 922 (Statistical Methods); 921 (Applied Mathematics)
72 (COMPUTERS & DATA PROCESSING); 93 (ENGINEERING PHYSICS); 73 (CONTROL ENGINEERING); 92 (ENGINEERING MATHEMATICS)

1/5/52 (Item 3 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

06844113 E.I. No: EIP04208158424

Title: Capacity of Oscillatory Associative-Memory Networks with Error-Free Retrieval
Author: Nishikawa, Takashi; Lai, Ying-Cheng; **Hoppensteadt, Frank C.**
Corporate Source: Department of Mathematics Southern Methodist University 208 Clements Hall, Dallas, TX 75275-0156, United States
Source: Physical Review Letters v 92 n 10 Mar 12 2004. p 108101-1-108101-4
Publication Year: 2004
CODEN: PRLTAO ISSN: 0031-9007
Language: English
Document Type: JA; (Journal Article) Treatment: T; (Theoretical); X; (Experimental)
Journal Announcement: 0405W3
Abstract: An analysis of the local stability of the error-free memory pattern solutions for a new type of oscillatory model of associative memory was discussed. The model includes an extra, second-order Fourier mode in the coupling function, which enables us to control the stability of the solutions for all patterns and to distinguish the memory pattern form others by their stabilities. This model was closely related to the cumulative distribution function of spikes in neural networks. The capacity of model turns out to follow the same scaling with the number of neurons as in the case of the classical Hopfield model, but with a prefactor that depends on the relative strength of the second-order mode. (Edited abstract) 24 Refs.
Descriptors: *Neural networks; Phase locked loops; Microelectromechanical devices; Resonators; Networks (circuits); Oscillations; Neurology; Computational methods; Matrix algebra; Approximation theory; Theorem proving; Mathematical models
Identifiers: Neuroscience; Phase-locked oscillations; Coupled periodic oscillators; Phase-locked loop circuits
Classification Codes:
723.4 (Artificial Intelligence); 713.5 (Other Electronic Circuits); 601.1 (Mechanical Devices); 704.1 (Electric Components); 703.1 (Electric Networks); 931.1 (Mechanics); 461.6 (Medicine); 921.1 (Algebra); 921.6 (Numerical Methods)
723 (Computer Software, Data Handling & Applications); 713 (Electronic Circuits); 601 (Mechanical Design); 704 (Electric Components & Equipment) ; 714 (Electronic Components & Tubes); 703 (Electric Circuits); 931 (Applied Physics Generally); 461 (Bioengineering); 921 (Applied Mathematics)
72 (COMPUTERS & DATA PROCESSING); 71 (ELECTRONICS & COMMUNICATION ENGINEERING); 60 (MECHANICAL ENGINEERING, GENERAL); 70 (ELECTRICAL ENGINEERING, GENERAL); 93 (ENGINEERING PHYSICS); 46 (BIOENGINEERING); 92 (ENGINEERING MATHEMATICS)

1/5/53 (Item 4 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

06704515 E.I. No: EIP04068003444
Title: Slowly coupled oscillators: Phase dynamics and synchronization
Author: Izhikevich, Eugene M.; **Hoppensteadt, Frank C.**
Corporate Source: The Neurosciences Institute, San Diego, CA 92121, United States
Source: SIAM Journal on Applied Mathematics v 63 n 6 August/September 2003. p 1935-1953
Publication Year: 2003
CODEN: SMJMAP ISSN: 0036-1399
Language: English
Document Type: JA; (Journal Article) Treatment: A; (Applications); T; (Theoretical); X; (Experimental)
Journal Announcement: 0402W2
Abstract: In this paper we extend the results of Frankel and Kiemel left bracket SIAM J. Appl. Math, 53 (1993), pp. 1436-1446 right bracket to a network of slowly coupled oscillators. First, we use Malkin's theorem to derive a canonical phase model that describes synchronization properties

of a slowly coupled network. Then, we illustrate the result using slowly coupled oscillators (1) near Andronov-Hopf bifurcations, (2) near saddle-node on invariant circle bifurcations, and (3) near relaxation oscillations. We compare and contrast synchronization properties of slowly and weakly coupled oscillators. 15 Refs.

Descriptors: *Mathematical models; Relaxation oscillators; Coupled circuits; Synchronization; Bifurcation (mathematics); Vectors; Asymptotic stability; Integral equations; Matrix algebra; Computer simulation

Identifiers: Coupled oscillators; Phase dynamics; Phase model; Saddle node on invariant circle; Excitability; Malkin theorem; MATLAB

Classification Codes:

921.6 (Numerical Methods); 713.2 (Oscillators); 731.1 (Control Systems); 921.1 (Algebra); 921.2 (Calculus); 723.5 (Computer Applications)

921 (Applied Mathematics); 713 (Electronic Circuits); 731 (Automatic Control Principles & Applications); 723 (Computer Software, Data Handling & Applications)

92 (ENGINEERING MATHEMATICS); 71 (ELECTRONICS & COMMUNICATION ENGINEERING); 73 (CONTROL ENGINEERING); 72 (COMPUTERS & DATA PROCESSING)

1/5/54 (Item 5 from file: 8)

DIALOG(R)File 8:Ei Compendex(R)

06643096 E.I. No: EIP03497769278

Title: System of phase oscillators with diagonalizable interaction

Author: Nishikawa, Takashi; **Hoppensteadt, Frank C.**

Corporate Source: Department of Mathematics Arizona State University, Tempe, AZ 85287-1804, United States

Source: SIAM Journal on Applied Mathematics v 63 n 5 June/August 2003. p 1615-1626

Publication Year: 2003

CODEN: SMJMAP ISSN: 0036-1399

Language: English

Document Type: JA; (Journal Article) Treatment: T; (Theoretical)

Journal Announcement: 0312W2

Abstract: A system of phase oscillators having distributed natural frequencies and diagonalizable interaction among the oscillators, was studied. The system was found to be almost incoherent in the limit of large system size. There was no sharp transition from incoherence to coherence as the coupling strength was increased. (Edited abstract) 20 Refs.

Descriptors: *Oscillators (electronic); Natural frequencies; Probability; Perturbation techniques; Mathematical transformations; Partial differential equations; Mathematical models

Identifiers: Phase oscillators

Classification Codes:

713.2 (Oscillators); 751.1 (Acoustic Waves); 922.1 (Probability Theory); 921.3 (Mathematical Transformations); 921.2 (Calculus)

713 (Electronic Circuits); 751 (Acoustics, Noise & Sound); 922 (Statistical Methods); 921 (Applied Mathematics)

71 (ELECTRONICS & COMMUNICATION ENGINEERING); 75 (SOUND & ACOUSTICAL TECHNOLOGY); 92 (ENGINEERING MATHEMATICS)

1/5/55 (Item 6 from file: 8)

DIALOG(R)File 8:Ei Compendex(R)

06489991 E.I. No: EIP03337595606

Title: Heterogeneity in oscillator networks: Are smaller worlds easier to synchronize?

Author: Nishikawa, Takashi; Motter, Adilson E.; Lai, Ying-Cheng; **Hoppensteadt, Frank C.**

Corporate Source: Department of Mathematics Southern Methodist University, Dallas, TX 75275-0156, United States

Source: Physical Review Letters v 91 n 1 Jul 4 2003. p 014101/1-014101/4
Publication Year: 2003
CODEN: PRLTAO ISSN: 0031-9007
Language: English
Document Type: JA; (Journal Article) Treatment: A; (Applications); T; (Theoretical); X; (Experimental)
Journal Announcement: 0308W4
Abstract: The common belief that smaller networks have better synchronization property can be misleading for a wide class of networks was shown. Using a general framework for synchronization stability of oscillator networks with arbitrary interaction topology, it was established that SF and SW networks will have reduced ability to synchronize as the heterogeneity of their connectivity distribution increases, even though the average network distance between the oscillators becomes smaller. The results show that in order for oscillators in a network to communicate better, and hence to synchronize more effectively, a balance between having small communication distance and uniform load distribution was essential. (Edited abstract) 48 Refs.
Descriptors: *Oscillators (electronic); Synchronization; Electric network topology; Equations of motion; Perturbation techniques; Eigenvalues and eigenfunctions; Lyapunov methods
Identifiers: Synchronizability; Scale-free property; Laplacian matrix; Lyapunov exponent
Classification Codes:
713.2 (Oscillators); 731.1 (Control Systems); 703.1 (Electric Networks); 921.2 (Calculus); 921.1 (Algebra)
713 (Electronic Circuits); 731 (Automatic Control Principles & Applications); 703 (Electric Circuits); 921 (Applied Mathematics)
71 (ELECTRONICS & COMMUNICATION ENGINEERING); 73 (CONTROL ENGINEERING); 70 (ELECTRICAL ENGINEERING, GENERAL); 92 (ENGINEERING MATHEMATICS)

1/5/56 (Item 7 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

06283484 E.I. No: EIP03057342939
Title: Smallest small-world network
Author: Nishikawa, Takashi; Motter, Adilson E.; Lai, Ying-Cheng; **Hoppensteadt, Frank C.**
Corporate Source: Department of Mathematics Ctr. for Systems Sci. and Eng. Res. Arizona State University, Tempe, AZ 85287, United States
Source: Physical Review E - Statistical Physics, Plasmas, Fluids, and Related Interdisciplinary Topics v 66 n 4 2 October 2002. p 046139/1-046139/5
Publication Year: 2002
CODEN: PLEEE8 ISSN: 1063-651X
Language: English
Document Type: JA; (Journal Article) Treatment: A; (Applications); T; (Theoretical)
Journal Announcement: 0302W1
Abstract: It was shown that among the small-world networks having a fixed number of shortcuts, the average path length was smallest when there exists a single center through which all of the shortcuts were connected and shortcut nodes were uniformly distributed in the network. It was shown that the average path length was almost as small when the shortcuts were connected and have a few centers, which was supported by the result of the GA simulations. As such, the results have important consequences in situations where the efficiency of information flow over a large network was required. (Edited abstract) 16 Refs.
Descriptors: *Statistical mechanics; Computer networks; Genetic algorithms; Computer simulation; Probability; Mathematical models; Random processes; Fault tolerant computer systems; World Wide Web; Neural networks ; Approximation theory
Identifiers: Small-world network; Random sparse networks; Genetic algorithm simulation
Classification Codes:

922.2 (Mathematical Statistics); 723.2 (Data Processing); 723.5 (Computer Applications); 922.1 (Probability Theory); 921.6 (Numerical Methods); 722.4 (Digital Computers & Systems)
922 (Statistical Methods); 723 (Computer Software, Data Handling & Applications); 921 (Applied Mathematics); 722 (Computer Hardware)
92 (ENGINEERING MATHEMATICS); 72 (COMPUTERS & DATA PROCESSING)

1/5/57 (Item 8 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

05853461 E.I. No: EIP01286577209
Title: Phase clustering and transition to phase synchronization in a large number of coupled nonlinear oscillators
Author: Liu, Z.; Lai, Y.-C.; **Hoppensteadt, F.C.**
Corporate Source: Department of Mathematics Arizona State University, Tempe, AZ 85287, United States
Source: Physical Review E. Statistical Physics, Plasmas, Fluids, and Related Interdisciplinary Topics v 63 n 5 II May 2001 2001. p 552011-552014
Publication Year: 2001
CODEN: PLEEE8 ISSN: 1063-651X
Language: English
Document Type: JA; (Journal Article) Treatment: T; (Theoretical)
Journal Announcement: 0107W3
Abstract: Transition to phase synchronization in systems having a large number of coupled nonlinear oscillators via phase clustering was investigated. The Kuramoto model was utilized as an analysis paradigm to understand coupled chaotic oscillators. The analysis revealed that phase clustering was more prevalent than full phase synchronization. (Edited abstract) 29 Refs.
Descriptors: *Oscillators (electronic); Synchronization; Lyapunov methods ; Chaos theory; Probability distributions; Approximation theory; Mathematical models
Identifiers: Phase clustering
Classification Codes:
713.2 (Oscillators); 731.1 (Control Systems); 922.1 (Probability Theory); 921.6 (Numerical Methods)
713 (Electronic Circuits); 731 (Automatic Control Principles & Applications); 922 (Statistical Methods); 921 (Applied Mathematics)
71 (ELECTRONICS & COMMUNICATION ENGINEERING); 73 (CONTROL ENGINEERING); 92 (ENGINEERING MATHEMATICS)

1/5/58 (Item 9 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

05685491 E.I. No: EIP00105371719
Title: Synchronization of laser oscillators, associative memory, and optical neurocomputing
Author: **Hoppensteadt, Frank C.** ; Izhikevich, Eugene M.
Corporate Source: Arizona State Univ, Tempe, AZ, USA
Source: Physical Review E. Statistical Physics, Plasmas, Fluids, and Related Interdisciplinary Topics v 62 n 3 B Sep 2000. p 4010-4013
Publication Year: 2000
CODEN: PLEEE8 ISSN: 1063-651X
Language: English
Document Type: JA; (Journal Article) Treatment: T; (Theoretical)
Journal Announcement: 0012W1
Abstract: The neurocomputational properties of phase-sensitive devices such as laser oscillators' networks were investigated. The interaction of laser oscillators with different optical phases corresponded to the phase of the phase modulation (PM) encoding. A mathematical model of a network of identical coupled lasers was developed by the reduction of Maxwell-Bloch equations after adiabatic elimination of the polarization. 19 Refs.
Descriptors: *Neural networks; Computer networks; Laser optics;

Oscillators (electronic); Associative processing; Holographic optical elements; Phase locked loops; Phase modulation; Frequency modulation; Mathematical models
  Identifiers: Optical neurocomputing; Laser oscillators; Neurons
  Classification Codes:
  723.4 (Artificial Intelligence); 741.1 (Light/Optics); 744.1 (Lasers, General); 713.2 (Oscillators); 723.2 (Data Processing)
  723 (Computer Software); 722 (Computer Hardware); 741 (Optics & Optical Devices); 744 (Lasers); 713 (Electronic Circuits)
  72 (COMPUTERS & DATA PROCESSING); 74 (OPTICAL TECHNOLOGY); 71 (ELECTRONICS & COMMUNICATIONS)

1/5/59 (Item 10 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

05669899 E.I. No: EIP00105352404
  Title: Neural computations by networks of oscillators
  Author: **Hoppensteadt, Frank** ; Izhikevich, Eugene
  Corporate Source: Arizona State Univ, Tempe, AZ, USA
  Conference Title: International Joint Conference on Neural Networks (IJCNN'2000)
  Conference Location: Como, Italy Conference Date: 19000724-19000727
  Sponsor: IEEE Neural Network Council; International Neural Network Society; European Neural Network Society
  E.I. Conference No.: 57395
  Source: Proceedings of the International Joint Conference on Neural Networks v 4 2000. IEEE, Piscataway, NJ, USA,00CB37142. p 41-44
  Publication Year: 2000
  CODEN: 85OFAE
  Language: English
  Document Type: CA; (Conference Article) Treatment: A; (Applications); T ; (Theoretical)
  Journal Announcement: 0011W3
  Abstract: We describe here how a network of oscillators can perform neural computations. In particular, it shown how the connectivity within the network can be created to memorize data in terms of phase relations between synchronized states. The memorized states are extracted through correlation calculations. The influence of noise on the system is discussed. (Author abstract) 4 Refs.
  Descriptors: *Neural networks; Oscillators (electronic); Computational complexity; Synchronization; Correlation methods; Spurious signal noise
  Identifiers: Neural computations
  Classification Codes:
  723.4 (Artificial Intelligence); 713.2 (Oscillators); 721.1 (Computer Theory, Includes Formal Logic, Automata Theory, Switching Theory, Programming Theory); 731.1 (Control Systems); 922.2 (Mathematical Statistics); 701.1 (Electricity: Basic Concepts & Phenomena)
  723 (Computer Software); 713 (Electronic Circuits); 721 (Computer Circuits & Logic Elements); 731 (Automatic Control Principles); 922 (Statistical Methods); 701 (Electricity & Magnetism)
  72 (COMPUTERS & DATA PROCESSING); 71 (ELECTRONICS & COMMUNICATIONS); 73 (CONTROL ENGINEERING); 92 (ENGINEERING MATHEMATICS); 70 (ELECTRICAL ENGINEERING)

1/5/60 (Item 11 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

05640397 E.I. No: EIP00095308894
  Title: Pattern recognition via synchronization in phase-locked loop neural networks
  Author: **Hoppensteadt, Frank C.** ; Izhikevich, Eugene M.
  Corporate Source: Arizona State Univ, Tempe, AZ, USA
  Source: IEEE Transactions on Neural Networks v 11 n 3 May 2000. p 734-738

Publication Year: 2000
CODEN: ITNNEP ISSN: 1045-9227
Language: English
Document Type: JA; (Journal Article) Treatment: A; (Applications); X; (Experimental)
Journal Announcement: 0010W2
Abstract: We propose a novel architecture of an oscillatory neural network that consists of phase-locked loop (PLL) circuits. It stores and retrieves complex oscillatory patterns as synchronized states with appropriate phase relations between neurons. (Author abstract) 15 Refs.
Descriptors: *Neural networks; Phase locked loops; Variable frequency oscillators; Pattern recognition; Synchronization; Phase shifters; Natural frequencies
Identifiers: Phase locked loop neural networks; Brain rhythms; Oscillatory associative memory
Classification Codes:
723.4 (Artificial Intelligence); 713.5 (Other Electronic Circuits); 713.2 (Oscillators); 723.5 (Computer Applications)
723 (Computer Software); 713 (Electronic Circuits)
72 (COMPUTERS & DATA PROCESSING); 71 (ELECTRONICS & COMMUNICATIONS)

1/5/61 (Item 12 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

05561397 E.I. No: EIP00055173318
Title: Oscillatory model of the hippocampal memory
Author: Borisyuk, Roman; **Hoppensteadt, Frank**
Corporate Source: Univ of Plymouth, Plymouth, UK
Conference Title: International Joint Conference on Neural Networks (IJCNN'99)
Conference Location: Washington, DC, USA Conference Date: 19990710-19990716
Source: Proceedings of the International Joint Conference on Neural Networks v 1 1999. IEEE, USA. p 42-45
Publication Year: 1999
CODEN: 85OFAE
Language: English
Document Type: CA; (Conference Article) Treatment: T; (Theoretical)
Journal Announcement: 0007W1
Abstract: We describe a biologically inspired oscillatory neural network for memorizing temporal sequences of neural activity patterns. The neural network consists of interactive neural oscillators with all-to-all excitatory connections forced by a slow T-periodic signal. The dynamics of the network are viewed through a time window with duration T. The network memorizes binary patterns in terms of low and high activity of the corresponding oscillators. The learning rule is temporally asymmetric, and it takes into account the activity level of pre- and post-`synaptic' oscillators in two contiguous time windows. Recall by the network is fast: All memorized patterns of sequences are reproduced in the correct order during the same time window, but with a short time delay. The applicability of these results to studies of the hippocampus is discussed. (Author abstract) 10 Refs.
Descriptors: *Neural networks; Pattern recognition; Learning systems; Knowledge based systems; Mathematical models
Identifiers: Hippocampal memory; Oscillatory neural networks; Excitatory connections
Classification Codes:
723.4.1 (Expert Systems)
461.1 (Biomedical Engineering); 723.4 (Artificial Intelligence); 461.4 (Human Engineering)
461 (Biotechnology); 723 (Computer Software); 921 (Applied Mathematics)
46 (BIOENGINEERING); 72 (COMPUTERS & DATA PROCESSING); 92 (ENGINEERING MATHEMATICS)

1/5/62 (Item 13 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

04861796 E.I. No: EIP97103899576
Title: Implementation of Minimum Inventory Variability Scheduling 1-Step Ahead Policy in a large semiconductor manufacturing facility
Author: Collins, Donald W.; Williams, Ken; **Hoppensteadt, Frank C.**
Corporate Source: Arizona State Univ East, Mesa, AZ, USA
Conference Title: Proceedings of the 1997 IEEE 6th International Conference on Emerging Technologies and Factory Automation, ETFA'97
Conference Location: Los Angeles, CA, USA Conference Date: 19970909-19970912
Sponsor: IEEE
E.I. Conference No.: 47152
Source: IEEE Symposium on Emerging Technologies & Factory Automation, ETFA 1997. IEEE, Piscataway, NJ, USA,97TH8314. p 497-504
Publication Year: 1997
CODEN: 85ROAM
Language: English
Document Type: CA; (Conference Article) Treatment: G; (General Review); T; (Theoretical)
Journal Announcement: 9712W4
Abstract: This paper describes an implementation of the 1-Step Ahead Minimum Inventory Variability Resource Scheduling Policy, in a large semiconductor facility (FAB) over the period from May, 1996, through January, 1997. The FAB described here uses a product release policy based on customer orders and a work-in-progress (WIP) chart. The scheduling of resource tools was done on a first in, first out (FIFO) basis on high speed tools and due date first (DDF) at bottleneck tools, except for high priority lots, called MAXI's. The FAB is discussed in generic terms (sanitized) because of the proprietary nature of the devices manufactured. Percentages of change in cycle time and output are presented. (Author abstract) 18 Refs.
Descriptors: *Production control; Inventory control; Semiconductor device manufacture; Scheduling
Identifiers: Inventory variability scheduling
Classification Codes:
913.2 (Production Control); 911.3 (Inventory Control); 714.2 (Semiconductor Devices & Integrated Circuits)
913 (Production Planning & Control); 911 (Industrial Economics); 714 (Electronic Components)
91 (ENGINEERING MANAGEMENT); 71 (ELECTRONICS & COMMUNICATIONS)

1/5/63 (Item 14 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

04834568 E.I. No: EIP97093846855
Title: Investigation of minimum inventory variability scheduling policies in a large semiconductor manufacturing facility
Author: Collins, Donald W.; **Hoppensteadt, Frank C.**
Corporate Source: Arizona State Univ East, Mesa, AZ, USA
Conference Title: Proceedings of the 1997 American Control Conference. Part 3 (of 6)
Conference Location: Albuquerque, NM, USA Conference Date: 19970604-19970606
Sponsor: IEEE
E.I. Conference No.: 47028
Source: Proceedings of the American Control Conference v 3 1997. IEEE, Piscataway, NJ, USA,97CH36041. p 1924-1928
Publication Year: 1997
CODEN: PRACEO ISSN: 0743-1619
Language: English
Document Type: CA; (Conference Article) Treatment: T; (Theoretical)

Journal Announcement: 9711W3

Abstract: This paper describes some problems and investigations encountered when implementing new resource scheduling policies in a large semiconductor manufacturing facility (FAB). The FAB described here uses a product release policy based on customer orders and a work-in-progress (WIP) chart. The scheduling of resource tools is done on a first in, first out (FIFO) basis on high speed tools and due date first (DDF) at bottleneck tools, except for high priority LOTS, called MAXI's. Minimum Inventory Variability Scheduling Policies (MIVSP) were introduced in February 1996. The development of a simulation model representing the FAB and a partial implementation of MIVSP were completed over the period from May, 1996, through January, 1997. This presentation describes briefly the theory behind MIVSP. A heuristic explanation of the minimum inventory variability for resource scheduling policies is given here. Finally a large semiconductor manufacturing facility is discussed in generic terms, including (sanitized) data collection. The results of the baseline output and historical data are compared to MIVSP. (Author abstract) 13 Refs.

Descriptors: *Semiconductor device manufacture; Production control; Resource allocation; Computer simulation; Inventory control; Scheduling

Identifiers: Minimum inventory variability scheduling policies (MIVSP); Work in progress (WIP) chart

Classification Codes:

714.2 (Semiconductor Devices & Integrated Circuits); 913.2 (Production Control); 912.2 (Management); 723.5 (Computer Applications)

714 (Electronic Components); 913 (Production Planning & Control); 912 (Industrial Engineering & Management); 723 (Computer Software)

71 (ELECTRONICS & COMMUNICATIONS); 91 (ENGINEERING MANAGEMENT); 72 (COMPUTERS & DATA PROCESSING)

1/5/64 (Item 15 from file: 8)

DIALOG(R)File 8:Ei Compendex(R)

04810123 E.I. No: EIP97093808516

Title: Associative memory of weakly connected oscillators

Author: **Hoppensteadt, Frank C.** ; Izhikevich, Eugene M.

Corporate Source: Arizona State Univ, Tempe, AZ, USA

Conference Title: Proceedings of the 1997 IEEE International Conference on Neural Networks. Part 2 (of 4)

Conference Location: Houston, TX, USA Conference Date: 19970609-19970612

Sponsor: IEEE

E.I. Conference No.: 46924

Source: IEEE International Conference on Neural Networks - Conference Proceedings v 2 1997. IEEE, Piscataway, NJ, USA,97CB36109. p 1135-1138

Publication Year: 1997

CODEN: ICNNF9

Language: English

Document Type: CA; (Conference Article) Treatment: T; (Theoretical)

Journal Announcement: 9710W4

Abstract: It is a well-known fact that oscillatory networks can operate as Hopfield-like neural networks, the only difference being that their attractors are limit cycles: one for each memorized pattern. The neuron activities are synchronized on the limit cycles, and neurons oscillate with fixed phase differences (time delays). We prove that this property is a natural attribute of general weakly connected neural networks, and it is relatively independent of the equations that describe the network activity. In particular, we prove an analogue of the Cohen-Grossberg convergence theorem for oscillatory neural networks. (Author abstract) 8 Refs.

Descriptors: *Neural networks; Associative storage; Bifurcation (mathematics); Convergence of numerical methods; Vectors

Identifiers: Weakly connected oscillators; Hopfield neural networks

Classification Codes:

723.4 (Artificial Intelligence); 722.1 (Data Storage, Equipment & Techniques); 921.6 (Numerical Methods); 921.1 (Algebra)

723 (Computer Software); 722 (Computer Hardware); 921 (Applied

Mathematics)
72 (COMPUTERS & DATA PROCESSING); 92 (ENGINEERING MATHEMATICS)

1/5/65 (Item 16 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

04809971 E.I. No: EIP97093808366
Title: Thalamo-cortical interactions modeled by forced weakly connected oscillatory networks
Author: **Hoppensteadt, Frank C.** ; Izhikevich, Eugene M.
Corporate Source: Arizona State Univ, Tempe, AZ, USA
Conference Title: Proceedings of the 1997 IEEE International Conference on Neural Networks. Part 1 (of 4)
Conference Location: Houston, TX, USA Conference Date: 19970609-19970612
Sponsor: IEEE
E.I. Conference No.: 46924
Source: IEEE International Conference on Neural Networks - Conference Proceedings v 1 1997. IEEE, Piscataway, NJ, USA,97CB36109. p 328-331
Publication Year: 1997
CODEN: ICNNF9
Language: English
Document Type: CA; (Conference Article) Treatment: T; (Theoretical)
Journal Announcement: 9710W4
Abstract: In this paper we do not discuss what a thalamo-cortical system modeled by a weakly connected oscillators can do, but we rather discuss what it cannot do. Interactions between any two cortical columns having oscillatory dynamics crucially depend on their frequencies. When the frequencies are different, the interactions are functionally insignificant (i.e., they average to zero) even when there are synaptic connections between the cortical columns. We say that there is a frequency gap that prevents interactions. When the frequencies are equal (or close) the oscillators interact via phase deviations. By adjusting the frequency of oscillations, each cortical column can turn on or off its connections with other columns. This mechanism resembles that of selective tuning in Frequency Modulated (FM) radios. A weak non-constant thalamic input can remove the frequency gap and link any two oscillators provided the input is chosen appropriately. In the case of many cortical columns with incommensurable frequency gaps the thalamic forcing will be chaotic. By adjusting its temporal activity, the thalamus has complete control over information processing taking place in important parts of the cortex. (Author abstract) 4 Refs.
Descriptors: *Neural networks; Mathematical models; Oscillators (electronic); Natural frequencies; Oscillations; Chaos theory; Data processing; Frequency modulation
Identifiers: Thalamo cortical interactions; Weakly connected neural networks (WCNN)
Classification Codes:
723.4 (Artificial Intelligence); 713.2 (Oscillators); 931.1 (Mechanics); 723.2 (Data Processing)
723 (Computer Software); 921 (Applied Mathematics); 713 (Electronic Circuits); 931 (Applied Physics); 922 (Statistical Methods)
72 (COMPUTERS & DATA PROCESSING); 92 (ENGINEERING MATHEMATICS); 71 (ELECTRONICS & COMMUNICATIONS); 93 (ENGINEERING PHYSICS)

1/5/66 (Item 17 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

04809970 E.I. No: EIP97093808365
Title: Canonical models for mathematical neuroscience
Author: **Hoppensteadt, Frank C.** ; Izhikevich, Eugene M.
Corporate Source: Arizona State Univ, Tempe, AZ, USA
Conference Title: Proceedings of the 1997 IEEE International Conference

on Neural Networks. Part 1 (of 4)
Conference Location: Houston, TX, USA Conference Date: 19970609-19970612
Sponsor: IEEE
E.I. Conference No.: 46924
Source: IEEE International Conference on Neural Networks - Conference Proceedings v 1 1997. IEEE, Piscataway, NJ, USA,97CB36109. p 324-327
Publication Year: 1997
CODEN: ICNNF9
Language: English
Document Type: CA; (Conference Article) Treatment: T; (Theoretical)
Journal Announcement: 9710W4
Abstract: A major drawback to most mathematical models in neuroscience is that they are either far away from reality or the results depend on the specific model. A promising alternative approach takes advantage of the fact that many complicated systems behave similarly when they operate near critical regimes, such as bifurcations. Using non-linear dynamical system theory it is possible to prove that all systems near certain critical regimes are governed by the same model, namely a canonical model. Briefly, a model is canonical if there is a continuous change of variables that transforms any other model that is near the same critical regime to this one. Thus, the question of plausibility of a mathematical model is replaced by the question of plausibility of the critical regime. Another advantage of the canonical model approach to neuroscience is that rigorous derivation of the models is possible even when only partial information is known about anatomy and physiology of brain structures. Then, studying canonical models can reveal some general laws and restrictions. In particular, one can determine what certain brain structures cannot accomplish regardless of their mathematical model. Since the existence of such canonical models might sound too good to be true, we present a list of some of them for weakly connected neural networks. Studying such canonical models provides information about all weakly connected neural networks, even those that have not been discovered yet. (Author abstract) 7 Refs.
Descriptors: *Neural networks; Mathematical models; System theory; Neurophysiology; Bifurcation (mathematics); Brain models
Identifiers: Mathematical neuroscience; Canonical models
Classification Codes:
723.4 (Artificial Intelligence); 461.6 (Medicine); 461.1 (Biomedical Engineering)
723 (Computer Software); 921 (Applied Mathematics); 461 (Biotechnology)
72 (COMPUTERS & DATA PROCESSING); 92 (ENGINEERING MATHEMATICS); 46 (BIOENGINEERING)

1/5/67 (Item 18 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

04141343 E.I. No: EIP95042678055
Title: Singular perturbation solutions of noisy systems
Author: **Hoppensteadt, Frank C.**
Corporate Source: Michigan State Univ, East Lansing, MI, USA
Source: SIAM Journal on Applied Mathematics v 55 n 2 Apr 1995. p 544-551
Publication Year: 1995
CODEN: SMJMAP ISSN: 0036-1399
Language: English
Document Type: JA; (Journal Article) Treatment: T; (Theoretical)
Journal Announcement: 9506W3
Abstract: Recent work on singular perturbation solutions that persist in the presence of noise is described. Two different settings are considered: small deviation theory in quasi-static problems, where there are small amplitude but highly irregular perturbations, and averaging problems where there are ergodic stochastic perturbations. In the first case, it is shown that quasi-static approximations can be valid when the underlying problem experiences small deviation perturbations in problems that are stable under persistent disturbances. In the second, averaging principles are described

for certain dynamical systems in Hilbert spaces that include applications to a wide variety of initial-boundary value problems for partial differential equations and for Volterra integral equations. These methods are applied here to four problems arising in applications. (Author abstract) 7 Refs.
Descriptors: *Perturbation techniques; Integral equations; Approximation theory; Problem solving; Convergence of numerical methods; Partial differential equations; Boundary value problems; Vectors
Identifiers: Singular perturbation methods; Stochastic integral equations ; Noisy systems; Averaging problems; Hilbert spaces
Classification Codes:
921.2 (Calculus); 921.6 (Numerical Methods); 921.1 (Algebra)
921 (Applied Mathematics)
92 (ENGINEERING MATHEMATICS)

1/5/68 (Item 19 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

03897402 E.I. No: EIP94071340324
Title: Particle method for population waves
Author: Chiu, Chichia; **Hoppensteadt, Frank C.**
Corporate Source: Michigan State Univ, East Lansing, MI, USA
Source: SIAM Journal on Applied Mathematics v 54 n 2 Apr 1994. p 466-477
Publication Year: 1994
CODEN: SMJMAP ISSN: 0036-1399
Language: English
Document Type: JA; (Journal Article) Treatment: T; (Theoretical)
Journal Announcement: 9409W1
Abstract: Phase models are useful for studying synchronization of bacterial cell culture growth and other biological events associated with cell cycles. This paper considers a model that allows the growth rate of cells to change at phases of cell cycle. In this paper, a particle method is derived for solving the weak formulation of this model, convergence of the particle method is proved.
Descriptors: *Cell culture; Growth kinetics; Mathematical models; Error analysis
Identifiers: Cell populations; Vortex methods; Particle methods; Cell cycle
Classification Codes:
461.2 (Biological Materials); 921.6 (Numerical Methods)
461 (Biotechnology); 921 (Applied Mathematics)
46 (BIOENGINEERING); 92 (ENGINEERING MATHEMATICS)

1/5/69 (Item 20 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

03025791 E.I. Monthly No: EIM9102-008448
Title: Computer simulation of a neural prism.
Author: **Hoppensteadt, F. C.**
Corporate Source: Dept of Math, Michigan State Univ, E Lansing, MI, USA
Conference Title: Proceedings of the 32nd Midwest Symposium on Circuits and Systems
Conference Location: Champaign, IL, USA Conference Date: 19890814
Sponsor: IEEE Circuits and Systems Soc; IEEE Acoustics, Speech, and Signal Processing Soc; IEEE Control Soc; IEEE Education Soc; IEEE Industrial Electronics Soc; IEEE Central Illinois Section
E.I. Conference No.: 13999
Source: Midwest Symposium on Circuits and Systems. Publ by IEEE, IEEE Service Center, Piscataway, NJ, USA (IEEE cat n 89CH2785-4). p 238-239
Publication Year: 1990
CODEN: MSCSDL
Language: English
Document Type: PA; (Conference Paper) Treatment: X; (Experimental)

Journal Announcement: 9102
Abstract: A network of voltage-controlled oscillator neuron (VCON) models is formed by a gradient of negative feedbacks, similar to a gradient of inhibitory connections in a neural system. A network of this kind is called a prism. Computer simulation notation to describe all the variables in the network is introduced. Computer simulation of the network shows that a smooth gradient of output frequencies results from monochromatic stimulation. 2 Refs.
Descriptors: *NEURAL NETWORKS--*Computer Simulation; VOLTAGE REGULATORS
Identifiers: NEURAL PRISMS; NEGATIVE FEEDBACKS
Classification Codes:
723 (Computer Software); 715 (General Electronic Equipment); 731 (Automatic Control Principles)
72 (COMPUTERS & DATA PROCESSING); 71 (ELECTRONICS & COMMUNICATIONS); 73 (CONTROL ENGINEERING)

1/5/70 (Item 21 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

01411573 E.I. Monthly No: EI8312100386 E.I. Yearly No: EI83019059
Title: ALGORITHM FOR APPROXIMATE SOLUTIONS TO WEAKLY FILTERED SYNCHRONOUS CONTROL SYSTEMS AND NONLINEAR RENEWAL PROCESSES.
Author: **Hoppensteadt, F. C.**
Corporate Source: Univ of Utah, Dep of Mathematics, Salt Lake City, Utah, USA
Source: SIAM Journal on Applied Mathematics v 43 n 4 Aug 1983 p 834-843
Publication Year: 1983
CODEN: SMJMAP ISSN: 0036-1399
Language: ENGLISH
Journal Announcement: 8312
Abstract: A multi-time perturbation algorithm is derived to study certain synchronous control systems and nonlinear renewal processes. The new methods presented here study singular perturbation problems for nonlinear Volterra integro-differential equations whose kernels are close to the Dirac delta function. The algorithm provides useful approximate solutions to weakly filtered phase-locked loop circuits and to nonlinear renewal equations describing certain population dynamics. 11 refs.
Descriptors: *CONTROL SYSTEMS; MATHEMATICAL TECHNIQUES--Integrodifferential Equations
Classification Codes:
731 (Automatic Control Principles); 921 (Applied Mathematics)
73 (CONTROL ENGINEERING); 92 (ENGINEERING MATHEMATICS)

1/5/71 (Item 22 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

01117880 E.I. Monthly No: EI8205036804 E.I. Yearly No: EI82009312
Title: INTEGRATE-AND-FIRE MODELS OF NERVE MEMBRANE RESPONSE TO OSCILLATORY INPUT.
Author: Keener, J. P.; **Hoppensteadt, F. C.** ; Rinzel, J.
Corporate Source: Univ of Utah, Salt Lake City, USA
Source: SIAM Journal on Applied Mathematics v 41 n 3 Dec 1981 p 503-517
Publication Year: 1981
CODEN: SMJMAP ISSN: 0036-1399
Language: ENGLISH
Journal Announcement: 8205
Abstract: Nerve membranes exhibit curious responses to alternating current stimulation, among which are phase locking, as well as reponses without apparent periodic pattern. These phenomena are investigated by presenting a complete analysis of the response to periodic input of an integrate-and-fire model, which is a simplified version of the Hodgkin-Huxley theory for space clamped nerves. 13 refs.
Descriptors: *BIOMEDICAL ENGINEERING--*Neurophysiology

Classification Codes:
461 (Biotechnology)
46 (BIOENGINEERING)

1/5/72 (Item 23 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

01066439 E.I. Monthly No: EI8107057371 E.I. Yearly No: EI81043855
Title: THRESHOLD ANALYSIS OF A DRUG USE EPIDEMIC MODEL.
Author: **Hoppensteadt, F. C.** ; Murray, J. D.
Corporate Source: Univ of Utah, Salt Lake City
Source: Mathematical Biosciences v 53 n 1-2 Feb 1981 p 79-87
Publication Year: 1981
CODEN: MABIAR ISSN: 0025-5564
Language: ENGLISH
Journal Announcement: 8107
Abstract: A model of an individual's response to a drug is formulated first. This is based on interaction between applied dosage of the drug and active and inactive receptor sites in the body. Next, a population of such individuals is considered. These are divided among nonusers (susceptibles), active users, and individuals removed through treatment and cure, disenchantment, etc. Recruitment of susceptibilities to active drug use is assumed to occur through contact with active users, and the effectiveness of recruitment (or infectiousness) depends on the age of a user. The model is based solely on the user's response to the drug, and it is shown that when a certain combination of susceptible population size, individual susceptibility, and infectiousness does not exceed a critical threshold value, there will be only few users. But when the threshold value is exceeded, an epidemic of drug use ensues. 2 refs.
Descriptors: *HEALTH CARE--*Epidemiology; DRUG PRODUCTS
Classification Codes:
461 (Biotechnology); 462 (Medical Engineering & Equipment); 804 (Chemical Products)
46 (BIOENGINEERING); 80 (CHEMICAL ENGINEERING)

1/5/73 (Item 24 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

00791909 E.I. Monthly No: EI7902013114 E.I. Yearly No: EI79089515
Title: DYNAMICS OF THE JOSEPHSON JUNCTION.
Author: Levi, M.; **Hoppensteadt, F. C.** ; Miranker, W. L.
Corporate Source: New York Univ, Courant Inst, NY
Source: Quarterly of Applied Mathematics v 36 n 2 Jul 1978 p 167-198
Publication Year: 1978
CODEN: QAMAAY ISSN: 0033-569X
Language: ENGLISH
Journal Announcement: 7902
Abstract: A study is carried out of the sine-Gordon equation and systems of discrete approximations to it which are respectively a model of the Josephson junction and models of coupled-point Josephson junctions. The so-called current-drive case is considered. The voltage response of these devices is the average of the time derivative of the solution of these equations and the authors demonstrate the existence of running periodic solutions for which the average exists. Static solutions are also studied. These together with the running solutions explain the multiple-valuedness in the response of a Josephson junction in several cases. The stability of the various solutions is described in some of the cases. Numerical results are displayed which give details of structure of solution types in the case of a single point junction and of the one-dimensional distributed junction. 10 refs.
Descriptors: *SUPERCONDUCTING DEVICES
Classification Codes:
704 (Electric Components & Equipment)

70 (ELECTRICAL ENGINEERING)

1/5/74 (Item 25 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

00700205 E.I. Monthly No: EI7803016769 E.I. Yearly No: EI78021979
Title: SLOWLY MODULATED OSCILLATIONS IN NONLINEAR DIFFUSION PROCESSES.
Author: Cohen, Donald S.; **Hoppensteadt, Frank C.**; Miura, Robert M.
Corporate Source: Calif Inst of Technol, Pasadena
Source: SIAM Journal on Applied Mathematics v 33 n 2 Sep 1977 p 217-288
Publication Year: 1977
CODEN: SMJMAP ISSN: 0036-1399
Language: ENGLISH
Journal Announcement: 7803
Abstract: It is shown here that certain systems of nonlinear (parabolic) reaction-diffusion equations have solutions which are approximated by oscillatory functions in the form R(XI MINUS c TAU)P(t*) where P(t) represents a sinusoidal oscillation on a fast time scale t and R(XI MINUS c TAU) represents a slowly-varying modulating amplitude on slow space (XI) and slow time (TAU) scales. Such solutions describe phenomena in chemical reactors, chemical and biological reactions, and in other media where a stable oscillation at each point (or site) undergoes a slow amplitude change due to diffusion. 19 refs.
Descriptors: *DIFFUSION; CHEMICAL REACTIONS; BIOCHEMICAL ENGINEERING; CHEMICAL EQUIPMENT--Reactors
Classification Codes:
801 (Chemical Analysis & Physical Chemistry); 802 (Chemical Apparatus & Plants); 931 (Applied Physics)
80 (CHEMICAL ENGINEERING); 93 (ENGINEERING PHYSICS)

1/5/75 (Item 26 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

00469272 E.I. Monthly No: EI7507046322 E.I. Yearly No: EI75045522
Title: ASYMPTOTIC BEHAVIOR OF SOLUTIONS TO A POPULATION EQUATION.
Author: Greenberg, J. M.; **Hoppensteadt, F.**
Corporate Source: NY Univ, New York
Source: SIAM Journal on Applied Mathematics v 28 n 3 May 1975 p 662-674
Publication Year: 1975
CODEN: SMJMAP ISSN: 0036-1399
Language: ENGLISH
Journal Announcement: 7507
Abstract: This is a study of the large time behavior of solutions x(t) to the nonlinear equation x(t) = GAMMA INTEGRAL x(ETA)(1 MINUS x(ETA))d ETA , where the integration is from ETA = t MINUS 1 to ETA = 1, which satisfy 0 LESS THAN EQUIVALENT TO x(t) LESS THAN EQUIVALENT TO 1. It is known that such solutions approach constants as t YIELDS INFINITY . This paper investigates the way in which the limit is attained. 3 refs.
Descriptors: *MATHEMATICAL TECHNIQUES--*Integral Equations
Classification Codes:
921 (Applied Mathematics)
92 (ENGINEERING MATHEMATICS)

1/5/76 (Item 27 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

00459701 E.I. Monthly No: EI7506039151 E.I. Yearly No: EI75045280
Title: ANALYSIS OF SOME PROBLEMS HAVING MATCHED ASYMPTOTIC EXPANSION SOLUTIONS.
Author: **Hoppensteadt, Frank**
Corporate Source: Courant Inst of Math Sci, New York Univ, NY

Source: SIAM Review v 17 n 1 Jan 1975 p 123-135
Publication Year: 1975
CODEN: SIREAD ISSN: 0036-1445
Language: ENGLISH
Journal Announcement: 7506
Abstract: Several examples are presented which illustrate some capabilities and some limitations of the method of matched asymptotic expansions for solving evolution equations. The results are listed according to spectral properties of the linear problem resulting near a known steady state of the system. When the linear problem is stable, it is shown that the solution can be written as a (finite) sum of terms, each responding on a different time scale. When the linear problem is unstable, it is shown that the method can be used to determine initial data which excite only decaying modes, and, in the case of bifurcation of new steady states, to construct the new states as well as the transients to them. 35 refs.
Descriptors: *MATHEMATICAL TECHNIQUES--*Differential Equations
Classification Codes:
921 (Applied Mathematics)
92 (ENGINEERING MATHEMATICS)

1/5/77 (Item 28 from file: 8)
DIALOG(R)File 8:Ei Compendex(R)

00444404 E.I. Monthly No: EI7504021738 E.I. Yearly No: EI75007326
Title: AGE DEPENDENT EPIDEMIC MODEL.
Author: **Hoppensteadt, Frank**
Corporate Source: NY Univ, New York
Source: Journal of the Franklin Institute v 297 n 5 May 1974 p 325-333
Publication Year: 1974
CODEN: JFINAB ISSN: 0016-0032
Language: ENGLISH
Journal Announcement: 7504
Abstract: The model presented here describes the spread of an infection in a population by keeping track of the chronological ages of the participants as well as their " class ages " (i. e. the length of time since entering their present state). The reasoning behind this model is similar to that used in the equation of age dependent population growth. 7 refs.
Descriptors: *BIOMEDICAL ENGINEERING--*Mathematical Models; POPULATION STATISTICS
Identifiers: EPIDEMIC MODELS
Classification Codes:
461 (Biotechnology); 922 (Statistical Methods)
46 (BIOENGINEERING); 92 (ENGINEERING MATHEMATICS)

1/5/78 (Item 1 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

13155714 Genuine Article#: 853AN Number of References: 25
Title: Which model to use for cortical spiking neurons?
Author(s): **Izhikevich EM (REPRINT)**
Corporate Source: Inst Neurosci,San Diego//CA/92121 (REPRINT); Inst Neurosci,San Diego//CA/92121(Eugene.Izhikevich@nsi.edu)
Journal: IEEE TRANSACTIONS ON NEURAL NETWORKS, 2004, V15, N5 (SEP), P 1063-1070
ISSN: 1045-9227 Publication date: 20040900
Publisher: IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC, 445 HOES LANE, PISCATAWAY, NJ 08855 USA
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE; COMPUTER SCIENCE, HARDWARE & ARCHITECTURE; COMPUTER SCIENCE, THEORY &

METHODS; ENGINEERING, ELECTRICAL & ELECTRONIC
Abstract: We discuss the biological plausibility and computational efficiency of some of the most useful models of spiking and bursting neurons. We compare their applicability to large-scale simulations of cortical neural networks.
Descriptors--Author Keywords: chaos ; Hodgkin-Huxley ; pulse-coupled neural network (PCNN) ; quadratic integrate-and-fire (I&F) ; spike-timing
Identifiers--KeyWord Plus(R): NEURAL EXCITABILITY; NEOCORTICAL NEURONS; DYNAMICS; NETWORKS; OSCILLATIONS
Cited References:
CONNORS BW, 1990, V13, P99, TRENDS NEUROSCI
ERMENTROUT GB, 1996, V8, P979, NEURAL COMPUT
ERMENTROUT GB, 1986, V46, P233, SIAM J APPL MATH
FITZHUGH R, 1961, V1, P445, BIOPHYS J
GERSTNER W, 2002, SPIKING NEURON MODEL
GIBSON JR, 1999, V402, P75, NATURE
GRAY CM, 1996, V274, P109, SCIENCE
HODGKIN AL, 1948, V107, P165, J PHYSIOL-LONDON
HODGKIN AL, 1952, V117, P500, J PHYSIOL
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
IZHIKEVICH EM, 2001, V14, P883, NEURAL NETWORKS
IZHIKEVICH EM, 1999, V10, P499, IEEE T NEURAL NETWOR
IZHIKEVICH EM, 2000, V10, P1171, INT J BIFURCAT CHAOS
IZHIKEVICH EM, 2003, V26, P161, TRENDS NEUROSCI
IZHIKEVICH EM, 2004, V14, P933, CEREB CORTEX
IZHIKEVICH EM, IN PRESS DYNAMICAL S
IZHIKEVICH EM, IN PRESS IEEE T NEUR
IZHIKEVICH EM, 2003, V14, P1569, IEEE T NEURAL NETWOR
LATHAM PE, 2000, V83, P808, J NEUROPHYSIOL
LISMONT L, 1997, V20, P3, THEOR DEC C
MORRIS C, 1981, V35, P193, BIOPHYS J
RINZEL J, 1989, METHODS NEURONAL MOD
ROSE RM, 1989, V237, P267, P ROY SOC LOND B BIO
SMITH GD, 2000, V83, P588, J NEUROPHYSIOL
WILSON HR, 1999, V200, P375, J THEOR BIOL

1/5/79 (Item 2 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

12995156 Genuine Article#: 839WI Number of References: 23
Title: Modeling the cumulative distribution function of spikes in neural networks
Author(s): **Hoppensteadt F (REPRINT)**
Corporate Source: Arizona State Univ,Dept Math, Dept Elect Engn,POB 877606/Tempe//AZ/85287 (REPRINT); Arizona State Univ,Dept Math, Dept Elect Engn,Tempe//AZ/85287
Journal: INTERNATIONAL JOURNAL OF BIFURCATION AND CHAOS, 2004, V14, N5 (MAY), P1549-1558
ISSN: 0218-1274 Publication date: 20040500
Publisher: WORLD SCIENTIFIC PUBL CO PTE LTD, 5 TOH TUCK LINK, SINGAPORE 596224, SINGAPORE
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: MATHEMATICS, INTERDISCIPLINARY APPLICATIONS; MULTIDISCIPLINARY SCIENCES
Abstract: Important components of neural networks are input synapses, action potential generators and output synapses. Rather than modeling a whole neuron in terms of a few ionic channels or as having Hodgkin-Huxley, Morris-Lecar or FitzHugh-Nagumo dynamics, we describe a neuron's action potential generator (APG). An APG may be at the hillock region at the base of an axon or another specific region of a cell. We model it using bifurcation theory based on observations by A. F. Hodgkin about membrane excitability. The result is a simplified model that leads us to view a neural network as comprising input and output synapses (electrical or chemical) that network APGs. These centers of

activity are coupled by transfer functions from input synapses to an APG and from an APG to output synapses. The transfer functions account for time delays and signal attenuation that result from input and output structures. While this falls far short of a complete biophysical model of specific neurons in a network, it is consistent with empirical data, it is easily formulated, it is analytically tractable, and computer simulations based on it are straightforward. One outcome is a precise description of the cumulative distribution function (CDF) of action potentials. Since records of cell firing amount to collections of CDFs, the model is for a variable that is accessible to experimental observation. This methodology is applied here to describe bursting neural circuits and embedded loop networks similar to those occurring in basal ganglia.
Descriptors--Author Keywords: VCON ; implicit differential equations ; rate coupled networks ; cdf ; pdf of action potentials
Identifiers--KeyWord Plus(R): NEURONS
Cited References:
COSTA MC, 2002, V5, P533, NAT NEUROSCI
EINSTEIN A, 1934, METHOD THEORETICAL P
ENGELMANN J, 2002, V188, P513, J COMP PHYSIOL A
ERMENTROUT GB, 1996, V8, P979, NEURAL COMPUT
ERMENTROUT GB, 1986, V46, P233, SIAM J APPL MATH
FEYNMAN R, 1963, LECT PHYS
HODGKIN AL, 1948, V107, P165, J PHYSIOL-LONDON
HOPPENSTADT FC, 2000, ANAL SIMULATION CHAO
HOPPENSTEADT FC, 1979, V17, P131, LECT MATH
HOPPENSTEADT FC, 1997, INTRO MATH NEURONS M
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
HOROWITZ P, 1989, ART ELECT
IZHIKEVICH EM, 2000, V10, P1171, INT J BIFURCAT CHAOS
IZHIKEVICH EM, 2002, V67, P95, SIAM J APPL MATH
IZHIKEVICH EM, 2003, V26, P161, TRENDS NEUROSCI
KANDEL ER, 2001, PRINCIPLES NEURAL SC
MONTGOMERY EB, 2002, P131, DEEP BRAIN STIMULATI
SELVERSTEN A, 1989, COMPUTING NEURON
SKOROKHOD AV, RANDOM PERTURBATION
SMITH GD, 2000, V83, P588, J NEUROPHYSIOL
THOM Y, 1989, STRUCTURAL STABILITY
VONNEUMANN J, 1955, V5, COLLECTED WORKS
WILSON HR, 1972, V12, P1, BIOPHYS J

1/5/80 (Item 3 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

12951727 Genuine Article#: 836NT Number of References: 54
Title: Spike-timing dynamics of neuronal groups
Author(s): **Izhikevich EM (REPRINT)** ; Gally JA; Edelman GM
Corporate Source: Inst Neurosci,10640 John Jay Hopkins Dr/San Diego//CA/92121 (REPRINT); Inst Neurosci,San Diego//CA/92121(eugene.izhikevich@nsi.edu)
Journal: CEREBRAL CORTEX, 2004, V14, N8 (AUG), P933-944
ISSN: 1047-3211 Publication date: 20040800
Publisher: OXFORD UNIV PRESS INC, JOURNALS DEPT, 2001 EVANS RD, CARY, NC 27513 USA
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: NEUROSCIENCES
Abstract: A neuronal network inspired by the anatomy of the cerebral cortex was simulated to study the self-organization of spiking neurons into neuronal groups. The network consisted of 100 000 reentrantly interconnected neurons exhibiting known types of cortical firing patterns, receptor kinetics, short-term plasticity and long-term spike-timing-dependent plasticity (STDP), as well as a distribution of axonal conduction delays. The dynamics of the network allowed us to study the fine temporal structure of emerging firing patterns with

millisecond resolution. We found that the interplay between STDP and conduction delays gave rise to the spontaneous formation of neuronal groups - sets of strongly connected neurons capable of firing time-locked, although not necessarily synchronous, spikes. Despite the noise present in the model, such groups repeatedly generated patterns of activity with millisecond spike-timing precision. Exploration of the model allowed us to characterize various group properties, including spatial distribution, size, growth, rate of birth, lifespan, and persistence in the presence of synaptic turnover. Localized coherent input resulted in shifts of receptive and projective fields in the model similar to those observed in vivo.
Descriptors--Author Keywords: persistence ; propagation delay ; reentry ; STDP ; synaptic turnover
Identifiers--KeyWord Plus(R): DEPENDENT SYNAPTIC PLASTICITY; EFFERENT NEURONS; SPATIOTEMPORAL PATTERNS; SUSPECTED INTERNEURONS; THALAMOCORTICAL SYSTEM; NEOCORTICAL NEURONS; INTRINSIC DYNAMICS; NEURAL ASSEMBLIES; AXONAL PROPERTIES; RECEPTIVE-FIELDS
Cited References:
ABELES M, 1991, CORTICONICS NEURAL C
ABELES M, 2002, P1143, HDB BRAIN THEORY NEU
AVIEL Y, 2003, V15, P1321, NEURAL COMPUT
BAKER SN, 2000, V84, P1770, J NEUROPHYSIOL
BAZHENOV M, 2002, V22, P8691, J NEUROSCI
BI GQ, 1998, V18, P10464, J NEUROSCI
BIENENSTOCK E, 1995, V6, P179, NETWORK-COMP NEURAL
BRAITENBERG V, 1991, ANATOMY CORTEX STAT
CHANG EY, 2000, V84, P1136, J NEUROPHYSIOL
CONNORS BW, 1990, V13, P99, TRENDS NEUROSCI
DAYAN P, 2001, THEORETICAL NEUROSCI
DEBANNE D, 1998, V507, P237, J PHYSIOL-LONDON
DIESMANN M, 1999, V402, P529, NATURE
EDELMAN GM, 1987, NEURAL DARWINISM THE
EDELMAN GM, 1993, V10, P115, NEURON
FELDMAN DE, 2000, V27, P45, NEURON
FROEMKE RC, 2002, V416, P433, NATURE
GIBSON JR, 1999, V402, P75, NATURE
GRUTZENDLER J, 2002, V420, P812, NATURE
GUPTA A, 2000, V287, P273, SCIENCE
IZHIKEVICH EM, 2003, V15, P1511, NEURAL COMPUT
IZHIKEVICH EM, 2003, V14, P1569, IEEE T NEURAL NETWOR
KEEFER EW, 2001, V86, P3030, J NEUROPHYSIOL
LATHAM PE, 2000, V83, P828, J NEUROPHYSIOL
LATHAM PE, 2000, V83, P808, J NEUROPHYSIOL
LEHKY SR, 1988, V333, P452, NATURE
LINDSEY BG, 1997, V78, P1714, J NEUROPHYSIOL
LUMER ED, 1997, V7, P207, CEREB CORTEX
LUMER ED, 1997, V7, P228, CEREB CORTEX
MAO BQ, 2001, V32, P883, NEURON
MARKRAM H, 1997, V275, P213, SCIENCE
MARKRAM H, 1998, V95, P5323, P NATL ACAD SCI USA
MERZENICH MM, 1983, V8, P133, NEUROSCIENCE
MILLER R, 1996, V75, P263, BIOL CYBERN
MILLER R, 1996, V75, P253, BIOL CYBERN
ORAM MW, 1999, V81, P3021, J NEUROPHYSIOL
PEARSON JC, 1987, V7, P4209, J NEUROSCI
PRUT Y, 1998, V79, P2857, J NEUROPHYSIOL
RUBIN J, 2001, V86, P364, PHYS REV LETT
SALAMI M, 2003, V100, P6174, P NATL ACAD SCI USA
SJOSTROM PJ, 2001, V32, P1149, NEURON
SONG S, 2000, V3, P919, NAT NEUROSCI
STERIADE M, 2001, V85, P1969, J NEUROPHYSIOL
SWADLOW HA, 1991, V66, P1392, J NEUROPHYSIOL
SWADLOW HA, 1994, V71, P437, J NEUROPHYSIOL
SWADLOW HA, 1992, V68, P605, J NEUROPHYSIOL
TETKO IV, 2001, V105, P1, J NEUROSCI METH
TETKO IV, 2001, V105, P15, J NEUROSCI METH
TIMOFEEV I, 2000, V10, P1185, CEREB CORTEX

TONONI G, 1992, V2, P310, CEREB CORTEX
TRACHTENBERG JT, 2002, V420, P788, NATURE
VANROSSUM MCW, 2000, V20, P8812, J NEUROSCI
VILLA AEP, 1999, V96, P1106, P NATL ACAD SCI USA
WAXMAN SG, 1972, V238, P217, NATURE-NEW BIOL

1/5/81 (Item 4 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

12602774 Genuine Article#: 802TK Number of References: 19
Title: Capacity of oscillatory associative-memory networks with error-free retrieval
Author(s): Nishikawa T (REPRINT) ; Lai YC; **Hoppensteadt FC**
Corporate Source: So Methodist Univ,Dept Math,208 Clements Hall/Dallas//TX/75275 (REPRINT); Arizona State Univ,Ctr Syst Sci & Engn Res, Dept Math,Tempe//AZ/85287; Arizona State Univ,Dept Elect Engn,Tempe//AZ/85287
Journal: PHYSICAL REVIEW LETTERS, 2004, V92, N10 (MAR 12), 108101
ISSN: 0031-9007 Publication date: 20040312
Publisher: AMERICAN PHYSICAL SOC, ONE PHYSICS ELLIPSE, COLLEGE PK, MD 20740-3844 USA
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: PHYSICS, MULTIDISCIPLINARY
Abstract: Networks of coupled periodic oscillators (similar to the Kuramoto model) have been proposed as models of associative memory. However, error-free retrieval states of such oscillatory networks are typically unstable, resulting in a near zero capacity. This puts the networks at disadvantage as compared with the classical Hopfield network. Here we propose a simple remedy for this undesirable property and show rigorously that the error-free capacity of our oscillatory, associative-memory networks can be made as high as that of the Hopfield network. They can thus not only provide insights into the origin of biological memory, but can also be potentially useful for applications in information science and engineering.
Identifiers--KeyWord Plus(R): NEURAL-NETWORK; NATURAL FREQUENCIES; SYNCHRONIZATION; PATTERNS; CORTEX; MODEL
Cited References:
AONISHI T, 1999, V82, P2800, PHYS REV LETT
AONISHI T, 1998, V58, P4865, PHYS REV E
AOYAGI T, 1995, V74, P4075, PHYS REV LETT
COOK J, 1989, V22, P2057, J PHYS A-MATH GEN
GRAY CM, 1989, V338, P334, NATURE
HERTZ J, 1991, INTRO THEORY NEURAL
HOPFIELD JJ, 1982, V79, P2554, P NATL ACAD SCI USA
HOPPENSTEADT FC, 2000, V11, P734, IEEE T NEURAL NETWOR
HOPPENSTEADT FC, 2000, V62, P4010, PHYS REV E B
HOPPENSTEADT FC, 2001, V48, P133, IEEE T CIRCUITS-I
KURAMOTO Y, 1984, CHEM OSCILLATIONS WA
LECUN Y, 1991, V66, P2396, PHYS REV LETT
MARCHENKO VA, 1967, V72, P507, MAT SBORNIK
NISHIKAWA T, IN PRESS
SCHWENKER F, 1996, V9, P445, NEURAL NETWORKS
STROGATZ SH, 2000, V143, P1, PHYSICA D
VAADIA E, 1995, V373, P515, NATURE
YAMANA M, 1999, V32, P3525, J PHYS A-MATH GEN
YOSHIOKA M, 2000, V61, P4732, PHYS REV E A

1/5/82 (Item 5 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

12439109 Genuine Article#: 765HE Number of References: 10
Title: Simple model of spiking neurons

Author(s): **Izhikevich EM (REPRINT)**
Corporate Source: Inst Neurosci,San Diego//CA/92121 (REPRINT); Inst Neurosci,San Diego//CA/92121
Journal: IEEE TRANSACTIONS ON NEURAL NETWORKS, 2003, V14, N6 (NOV), P 1569-1572
ISSN: 1045-9227 Publication date: 20031100
Publisher: IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC, 445 HOES LANE, PISCATAWAY, NJ 08855 USA
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE; COMPUTER SCIENCE, HARDWARE & ARCHITECTURE; COMPUTER SCIENCE, THEORY & METHODS; ENGINEERING, ELECTRICAL & ELECTRONIC
Abstract: A model is presented that reproduces spiking and bursting behavior of known types of cortical neurons. The model combines the biologically plausibility of Hodgkin-Huxley-type dynamics and the computational efficiency of integrate-and-fire neurons. Using this model, one can simulate tens of thousands of spiking cortical neurons in real time (1 ms resolution) using a desktop PC.
Descriptors--Author Keywords: bursting ; cortex ; Hodgkin-Huxley ; PCNN ; quadratic integrate-and-fire ; spiking ; thalamus
Cited References:
CONNORS BW, 1990, V13, P99, TRENDS NEUROSCI
ERMENTROUT GB, 1986, V46, P233, SIAM J APPL MATH
GIBSON JR, 1999, V402, P75, NATURE
GRAY CM, 1996, V274, P109, SCIENCE
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
HOPPENSTEADT FC, 2002, BRAIN THEORY NEURAL
IZHIKEVICH EM, IN PRESS DYNAMICAL S
IZHIKEVICH EM, 2001, V14, P883, NEURAL NETWORKS
IZHIKEVICH EM, 2000, V10, P1171, INT J BIFURCAT CHAOS
IZHIKEVICH EM, 2003, V26, P161, TRENDS NEUROSCI

1/5/83 (Item 6 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

12112257 Genuine Article#: 730DF Number of References: 15
Title: Slowly coupled oscillators: Phase dynamics and synchronization
Author(s): **Izhikevich EM (REPRINT) ; Hoppensteadt FC**
Corporate Source: Inst Neurosci,10640 John Jay Hopkins Dr/San Diego//CA/92121 (REPRINT); Inst Neurosci,San Diego//CA/92121; Arizona State Univ,Syst Sci & Engn Res Ctr,Tempe//AZ/85287
Journal: SIAM JOURNAL ON APPLIED MATHEMATICS, 2003, V63, N6, P1935-1953
ISSN: 0036-1399 Publication date: 20030000
Publisher: SIAM PUBLICATIONS, 3600 UNIV CITY SCIENCE CENTER, PHILADELPHIA, PA 19104-2688 USA
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: MATHEMATICS, APPLIED
Abstract: In this paper we extend the results of Frankel and Kiemel [SIAM J. Appl. Math, 53 (1993), pp. 1436 - 1446] to a network of slowly coupled oscillators. First, we use Malkin's theorem to derive a canonical phase model that describes synchronization properties of a slowly coupled network. Then, we illustrate the result using slowly coupledoscillators (1) near Andronov - Hopf bifurcations, (2) near saddle-node on invariant circle bifurcations, and (3) near relaxation oscillations. We compare and contrast synchronization properties of slowly and weakly coupledoscillators.
Descriptors--Author Keywords: phase model ; Andronov-Hopf ; saddle-node on invariant circle ; Class 1 excitability ; relaxation oscillators ; Malkin theorem ; MATLAB
Identifiers--KeyWord Plus(R): SILENT SYNAPSES; NETWORKS; MODELS
Cited References:
BRESSLOFF PC, 2000, V12, P91, NEURAL COMPUT
ERMENTROUT GB, 1996, V8, P979, NEURAL COMPUT

ERMENTROUT B, 1994, V6, P679, NEURAL COMPUT
FRANKEL P, 1993, V53, P1436, SIAM J APPL MATH
HANSEL D, 1995, V7, P307, NEURAL COMPUT
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
ISAAC JTR, 1995, V15, P427, NEURON
ISAAC JTR, 1997, V18, P269, NEURON
IZHIKEVICH EM, 1999, V10, P499, IEEE T NEURAL NETWOR
IZHIKEVICH EM, 2000, V60, P1789, SIAM J APPL MATH
KURAMOTO Y, 1984, CHEM OSCILLATIONS WA
MALKIN IG, 1956, SOME PROBLEMS NONLIN
MALKIN IG, 1949, METHODS POINCARE LIA
RINZEL J, 1992, V4, P534, NEURAL COMPUT
WILLIAMS TL, 1997, V4, P47, J COMPUT NEUROSCI

1/5/84 (Item 7 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

11963416 Genuine Article#: 713HD Number of References: 19
Title: System of phase oscillators with diagonalizable interaction
Author(s): Nishikawa T (REPRINT) ; **Hoppensteadt FC**
Corporate Source: Arizona State Univ,Dept Math,Tempe//AZ/85287 (REPRINT);
Arizona State Univ,Dept Math,Tempe//AZ/85287
Journal: SIAM JOURNAL ON APPLIED MATHEMATICS, 2003, V63, N5, P1615-1626
ISSN: 0036-1399 Publication date: 20030000
Publisher: SIAM PUBLICATIONS, 3600 UNIV CITY SCIENCE CENTER, PHILADELPHIA, PA 19104-2688 USA
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: MATHEMATICS, APPLIED
Abstract: We consider a system of N phase oscillators having randomly distributed natural frequencies and diagonalizable interactions among the oscillators. We show that, in the limit of N --> infinity, all solutions of such a system are incoherent with probability one for any strength of coupling, which implies that there is no sharp transition from incoherence to coherence as the coupling strength is increased, in striking contrast to Kuramoto's (special) oscillator system.
Descriptors--Author Keywords: network of phase oscillators ; Kuramoto model
Identifiers--KeyWord Plus(R): COUPLED OSCILLATORS; SYNCHRONIZATION; POPULATIONS; HYPOTHESIS; KURAMOTO; LOCKING; ARRAYS
Cited References:
BUCK J, 1988, V63, P265, Q REV BIOL
DURRETT R, 1991, PROBABILITY THEORY E
GRAY CM, 1994, V1, P11, J COMPUT NEUROSCI
HOPPENSTEADT FC, 1997, INTRO MATH NEURONS
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
HOROWITZ P, 1989, ART ELECT
JIANG ZP, 1993, V10, P155, J OPT SOC AM B
KOURTCHATOV SY, 1995, V52, P4089, PHYS REV A
KURAMOTO Y, 1984, CHEM OSCILLATIONS WA
MICHAELS DC, 1987, V61, P704, CIRC RES
PESKIN CS, 1975, MATH ASPECTS HEART P
SINGER W, 1995, V18, P555, ANNU REV NEUROSCI
STROGATZ SH, 2000, V143, P1, PHYSICA D
STROGATZ SH, 1994, V100, LECT NOTES BIOMATH
WIENER N, 1961, CYBERNETICS
WIENER N, 1958, NONLINEAR PROBLEMS R
WIESENFELD K, 1998, V57, P1563, PHYS REV E A
WIESENFELD K, 1996, V76, P404, PHYS REV LETT
WINFREE AT, 1967, V16, P15, J THEOR BIOL

1/5/85 (Item 8 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

11959904 Genuine Article#: 713RH Number of References: 40

Title: Probing changes in neural interaction during adaptation

Author(s): Zhu LQ (REPRINT) ; Lai YC; **Hoppensteadt FC** ; He JP
Corporate Source: Arizona State Univ,Ctr Syst Sci & Engn Res, Dept Elect Engn,Tempe//AZ/85287 (REPRINT); Arizona State Univ,Ctr Syst Sci & Engn Res, Dept Elect Engn,Tempe//AZ/85287; Arizona State Univ,Dept Math & Stat,Tempe//AZ/85287; Arizona State Univ,Dept Bioengn,Tempe//AZ/85287

Journal: NEURAL COMPUTATION, 2003, V15, N10 (OCT), P2359-2377
ISSN: 0899-7667 Publication date: 20031000
Publisher: M I T PRESS, FIVE CAMBRIDGE CENTER, CAMBRIDGE, MA 02142 USA
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE

Abstract: A procedure is developed to probe the changes in the functional interactions among neurons in primary motor cortex of the monkey brain during adaptation. A monkey is trained to learn a new skill, moving its arm to reach a target under the influence of external perturbations. The spike trains of multiple neurons in the primary motor cortex are recorded simultaneously. We utilize the methodology of directed transfer function, derived from a class of linear stochastic models, to quantify the causal interactions between the neurons. We find that the coupling between the motor neurons tends to increase during the adaptation but return to the original level after the adaptation. Furthermore, there is evidence that adaptation tends to affect the topology of the neural network, despite the approximate conservation of the average coupling strength in the network before and after the adaptation.

Identifiers--KeyWord Plus(R): PRIMATE MOTOR CORTEX; FREE ARM MOVEMENTS; INTERSPIKE INTERVALS; 3-DIMENSIONAL SPACE; NONLINEAR DYNAMICS; CELL DISCHARGE; VISUAL TARGETS; MONKEYS; PLASTICITY; DIRECTION

Cited References:

AKAIKE H, 1974, V19, P716, IEEE T AUTOMATIC CON
BRESSLER SL, 1993, V366, P153, NATURE
BRILLINGER DR, 1978, V1, P33, DEV STATISTICS
CASTRO R, 1997, V55, P287, PHYS REV E A
DING MZ, 2000, V83, P35, BIOL CYBERN
DUCKROW RB, 1992, V82, P415, ELECTROEN CLIN NEURO
FLORENCE SL, 1995, V15, P8083, J NEUROSCI
FREEMAN WJ, 1985, V10, P147, BRAIN RES REV
FREEMAN WJ, 1985, V61, PS224, ELECTROEN CLIN NEURO
SKARDA CA, 1987, V10, P161, BEHAV BRAIN SCI
FREIWALD WA, 1999, V94, P105, J NEUROSCI METH
GEORGOPOULOS AP, 1988, V8, P2928, J NEUROSCI
GEORGOPOULOS AP, 1982, V2, P1527, J NEUROSCI
GERSCH W, 1970, V7, P205, MATH BIOSCI
GOCHIN PM, 1991, V84, P505, EXP BRAIN RES
GRANGER CWJ, 1969, V37, P424, ECONOMETRICA
HE J, 2002, P IFAC C BARC
ITO M, 2000, V886, P237, BRAIN RES
JACOBS KM, 1991, V251, P944, SCIENCE
KAMINSKI MJ, 1991, V65, P203, BIOL CYBERN
KAMINSKI M, 2001, V85, P145, BIOL CYBERN
KARNI A, 1995, V377, P155, NATURE
LAI YC, 2002, V65, 031921, PHYS REV E 1
LI CSR, 2001, V30, P593, NEURON
MULLER JR, 1999, V285, P1405, SCIENCE
NUDO RJ, 1996, V16, P785, J NEUROSCI
PEARSON KG, 2000, V62, P723, ANNU REV PHYSIOL
RECANZONE GH, 1993, V13, P87, J NEUROSCI
SAMESHIMA K, 1999, V94, P93, J NEUROSCI METH
SANES JN, 2000, V23, P393, ANNU REV NEUROSCI
SAUER T, 1994, V72, P3811, PHYS REV LETT
SAUER T, 1991, V65, P579, J STAT PHYS
SAUER T, 1995, V5, P127, CHAOS
SAUER T, 1997, NONLINEAR TIME SERIE
SCHWARTZ AB, 1988, V8, P2913, J NEUROSCI
TAKENS F, 1981, V898, P366, LECT NOTES MATH

THEILER J, 1992, V58, P77, PHYSICA D
WEBER DJ, 2001, THESIS ARIZONA STATE
WHITTLE P, 1963, V50, P129, BIOMETRIKA
WILSON HR, 1999, SPIKES DECISIONS ACT

1/5/86 (Item 9 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

11808351 Genuine Article#: 696YP Number of References: 43
Title: Heterogeneity in oscillator networks: Are smaller worlds easier to synchronize?
Author(s): Nishikawa T (REPRINT) ; Motter AE; Lai YC; **Hoppensteadt FC**
Corporate Source: So Methodist Univ,Dept Math,208 Clements Hall,POB 750156/Dallas//TX/75275 (REPRINT); Arizona State Univ,Dept Math,Tempe//AZ/85287; Arizona State Univ,Dept Elect Engn,Tempe//AZ/85287
Journal: PHYSICAL REVIEW LETTERS, 2003, V91, N1 (JUL 4), 014101
ISSN: 0031-9007 Publication date: 20030704
Publisher: AMERICAN PHYSICAL SOC, ONE PHYSICS ELLIPSE, COLLEGE PK, MD 20740-3844 USA
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: PHYSICS, MULTIDISCIPLINARY
Abstract: Small-world and scale-free networks are known to be more easily synchronized than regular lattices, which is usually attributed to the smaller network distance between oscillators. Surprisingly, we find that networks with a homogeneous distribution of connectivity are more synchronizable than heterogeneous ones, even though the average network distance is larger. We present numerical computations and analytical estimates on synchronizability of the network in terms of its heterogeneity parameters. Our results suggest that some degree of homogeneity is expected in naturally evolved structures, such as neural networks, where synchronizability is desirable.
Identifiers--KeyWord Plus(R): COMPLEX NETWORKS; FRAGILITY; RESONANCE; EVOLUTION; STABILITY; DYNAMICS; INTERNET; TOPOLOGY; WEB
Cited References:
ALBERT R, 2002, V74, P47, REV MOD PHYS
ALBERT R, 1999, V401, P130, NATURE
AMARAL LAN, 2000, V97, P11149, P NATL ACAD SCI USA
BARABASI AL, 1999, V286, P509, SCIENCE
BARAHONA M, 2002, V89, 054101, PHYS REV LETT
BOLLOBAS B, 2002, HDB GRAPHS NETWORKS
BRAITENBERG V, 1998, P93, CORTEX STAT GEOMETRY
COHEN R, 2003, V90, 058701, PHYS REV LETT
DOROGOVTSEV SN, 2000, V50, P1, EUROPHYS LETT
DOROGOVTSEV SN, 2002, V51, P1079, ADV PHYS
DOROGOVTSEV SN, 2000, V62, P1842, PHYS REV E A
FALOUTSOS M, 1999, V29, P251, COMP COMM R
FINK KS, 2000, V61, P5080, PHYS REV E A
GADE PM, 2000, V62, P6409, PHYS REV E A
GOH KI, 2001, V87, 278701, PHYS REV LETT
HONG H, 2002, V65, 026139, PHYS REV E 2
IZHIKEVICH EM, 2003, V26, P161, TRENDS NEUROSCI
JOST J, 2001, V65, PHYS REV E
KANDEL ER, 2000, PRINCIPLES NEURAL SC
KARBOWSKI J, 2001, V86, P3674, PHYS REV LETT
KLEMM K, 2002, V65, 036123, PHYS REV E 2A
KLEMM K, 2002, V65, 057102, PHYS REV E 2
KWON O, 2002, V298, P319, PHYS LETT A
LAGOFERNANDEZ LF, 2000, V84, P2758, PHYS REV LETT
LATORA V, 2001, V87, 198701, PHYS REV LETT
LILJEROS F, 2001, V411, P907, NATURE
MONTOYA JM, 2002, V214, P405, J THEOR BIOL
MOTTER AE, 2002, V65, 065102, PHYS REV E 2
MOTTER AE, 2002, V66, 065103, PHYS REV E 2

NEWMAN MEJ, 2000, V84, P3201, PHYS REV LETT
NEWMAN MEJ, 2001, V64, 026118, PHYS REV E 2
NEWMAN MEJ, 2001, V98, P404, P NATL ACAD SCI USA
NEWMAN MEJ, 2001, V64, 016132, PHYS REV E 2
NISHIKAWA T, 2002, V66, 046139, PHYS REV E 2
PECORA LM, 1998, V80, P2109, PHYS REV LETT
SOLE RV, 2001, V268, P2039, P ROY SOC LOND B BIO
STEPHAN KE, 2000, V355, P111, PHILOS T ROY SOC B
STROGATZ SH, 2001, V410, P268, NATURE
WANG XF, 2002, V49, P54, IEEE T CIRCUITS-I
WANG XF, 2002, V12, P885, INT J BIFURCAT CHAOS
WANG XF, 2002, V12, P87, INT J BIFURCAT CHAOS
WATTS DJ, 1999, SMALL WORLDS
WATTS DJ, 1998, V393, P440, NATURE

1/5/87 (Item 10 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

11727667 Genuine Article#: 688EW Number of References: 19
Title: Relating STDP to BCM
Author(s): **Izhikevich EM (REPRINT)** ; Desai NS
Corporate Source: Inst Neurosci,San Diego//CA/92121 (REPRINT); Inst Neurosci,San Diego//CA/92121
Journal: NEURAL COMPUTATION, 2003, V15, N7 (JUL), P1511-1523
ISSN: 0899-7667 Publication date: 20030700
Publisher: M I T PRESS, FIVE CAMBRIDGE CENTER, CAMBRIDGE, MA 02142 USA
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE
Abstract: We demonstrate that the BCM learning rule follows directly from STDP when pre- and postsynaptic neurons fire uncorrelated or weakly correlated Poisson spike trains, and only nearest-neighbor spike interactions are taken into account.
Identifiers--KeyWord Plus(R): TERM SYNAPTIC PLASTICITY; VISUAL-CORTEX; PYRAMIDAL CELLS; NMDA RECEPTORS; DEPENDENCE; EXPERIENCE; NEURONS; MODEL; LTP
Cited References:
ABARBANEL HDI, 2002, V99, P10132, P NATL ACAD SCI USA
BEAR MF, 1994, V4, P389, CURR OPIN NEUROBIOL
BEAR MF, 1987, V237, P42, SCIENCE
BI GQ, 1998, V18, P10464, J NEUROSCI
BIENENSTOCK EL, 1982, V2, P32, J NEUROSCI
CASTELLANI GC, 2001, V98, P12772, P NATL ACAD SCI USA
DEBANNE D, 1998, V507, P237, J PHYSIOL-LONDON
FELDMAN DE, 2000, V27, P45, NEURON
FROEMKE RC, 2002, V416, P433, NATURE
KEMPTER R, 1999, V59, P4498, PHYS REV E
KEMPTER R, 2001, V13, P2709, NEURAL COMPUT
KIRKWOOD A, 1996, V381, P526, NATURE
KIRKWOOD A, 1993, V260, P1518, SCIENCE
MARKRAM H, 1997, V275, P213, SCIENCE
PHILPOT BD, 2001, V29, P157, NEURON
SENN W, 2001, V13, P35, NEURAL COMPUT
SJOSTROM PJ, 2001, V32, P1149, NEURON
SONG S, 2000, V3, P919, NAT NEUROSCI
VANROSSUM MCW, 2000, V20, P8812, J NEUROSCI

1/5/88 (Item 11 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

11439623 Genuine Article#: 651YQ Number of References: 34
Title: Bursts as a unit of neural information: selective communication via resonance

Author(s): Izhikevich EM (REPRINT) ; Desai NS; Walcott EC; Hoppensteadt FC
Corporate Source: Inst Neurosci,10640 John Jay Hopkins Dr/San Diego//CA/92121 (REPRINT); Inst Neurosci,San Diego//CA/92121; Arizona State Univ,Ctr Syst Sci,Tempe//AZ/85287
Journal: TRENDS IN NEUROSCIENCES, 2003, V26, N3 (MAR), P161-167
ISSN: 0166-2236   Publication date: 20030300
Publisher: ELSEVIER SCIENCE LONDON, 84 THEOBALDS RD, LONDON WC1X 8RR, ENGLAND
Language: English   Document Type: REVIEW
Geographic Location: USA
Journal Subject Category: NEUROSCIENCES
Abstract: What is the functional significance of generating a burst of spikes, as opposed to a single spike? A dominant point of view is that bursts are needed to increase the reliability of communication between neurons. Here, we discuss the alternative, but complementary, hypothesis: bursts with specific resonant interspike frequencies are more likely to cause a postsynaptic cell to fire than are bursts with higher or lower frequencies. Such a frequency preference might occur at the level of individual synapses because of the interplay between short-term synaptic depression and facilitation, or at the postsynaptic cell level because of subthreshold membrane potential oscillations and resonance. As a result, the same burst could resonate for some synapses or cells and not resonate for others, depending on their natural resonance frequencies. This observation suggests that, in addition to increasing reliability of synaptic transmission, bursts of action potentials might provide effective mechanisms for selective communication between neurons.
Identifiers--KeyWord Plus(R): SUBTHRESHOLD MEMBRANE RESONANCE; TERM SYNAPTIC PLASTICITY; GABAERGIC INTERNEURONS; FREQUENCY PREFERENCES; NEOCORTICAL NEURONS; THALAMIC NEURONS; OSCILLATIONS; SYNAPSES; CALCIUM; SYNCHRONIZATION
Cited References:
ABBOTT LF, 1997, V275, P220, SCIENCE
COBB SR, 1995, V378, P75, NATURE
DESMAISONS D, 1999, V19, P10727, J NEUROSCI
DITTMAN JS, 2000, V20, P1374, J NEUROSCI
FORTUNE ES, 2001, V24, P381, TRENDS NEUROSCI
FORTUNE ES, 2000, V20, P7122, J NEUROSCI
GUPTA A, 2000, V287, P273, SCIENCE
GUTFREUND Y, 1995, V483, P621, J PHYSIOL-LONDON
HEYWARD P, 2001, V21, P5311, J NEUROSCI
HODGKIN AL, 1954, V52, P5, B MATH BIOL
HODGKIN AL, 1952, V117, P500, J PHYSIOL
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
HOPPENSTEADT FC, 1998, V48, P85, BIOSYSTEMS
HUTCHEON B, 1996, V76, P698, J NEUROPHYSIOL
HUTCHEON B, 1994, V71, P583, J NEUROPHYSIOL
HUTCHEON B, 1996, V76, P683, J NEUROPHYSIOL
HUTCHEON B, 2000, V23, P216, TRENDS NEUROSCI
IZHIKEVICH EM, 2002, V67, P95, BIOSYSTEMS
IZHIKEVICH EM, 2001, V43, P315, SIAM REV
IZHIKEVICH EM, 2000, V10, P1171, INT J BIFURCAT CHAOS
IZHIKEVICH EM, 2001, V14, P883, NEURAL NETWORKS
IZHIKEVICH EM, 1999, V59, P2193, SIAM J APPL MATH
LAMPL I, 1993, V70, P2181, J NEUROPHYSIOL
LAMPL I, 1997, V78, P325, NEUROSCIENCE
LISMAN JE, 1997, V20, P38, TRENDS NEUROSCI
LLINAS RR, 1988, V242, P1654, SCIENCE
LLINAS RR, 1991, V88, P897, P NATL ACAD SCI USA
MARKRAM H, 1998, V95, P5323, P NATL ACAD SCI USA
NATSCHLAGER T, 2001, V13, P2477, NEURAL COMPUT
PEDROARENA C, 1997, V94, P724, P NATL ACAD SCI USA
PUIL E, 1994, V71, P575, J NEUROPHYSIOL
SINGER W, 1999, V9, P189, CURR OPIN NEUROBIOL
THOMSON AM, 2000, V62, P159, PROG NEUROBIOL
WU NP, 2001, V21, P3729, J NEUROSCI

1/5/89 (Item 12 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

11406812 Genuine Article#: 649HW Number of References: 70
Title: Numerical and experimental investigation of the effect of filtering on chaotic symbolic dynamics
Author(s): Zhu LQ (REPRINT) ; Lai YC; **Hoppensteadt FC** ; Bollt EM
Corporate Source: Arizona State Univ,Dept Elect Engn, Ctr Syst Sci & Engn Res,Tempe//AZ/85287 (REPRINT); Arizona State Univ,Dept Elect Engn, Ctr Syst Sci & Engn Res,Tempe//AZ/85287; Arizona State Univ,Dept Math,Tempe//AZ/85287; Clarkson Univ,Dept Math & Comp Sci,Potsdam//NY/13699
Journal: CHAOS, 2003, V13, N1 (MAR), P410-419
ISSN: 1054-1500 Publication date: 20030300
Publisher: AMER INST PHYSICS, CIRCULATION & FULFILLMENT DIV, 2 HUNTINGTON QUADRANGLE, STE 1 N O 1, MELVILLE, NY 11747-4501 USA
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: MATHEMATICS, APPLIED; PHYSICS, MATHEMATICAL
Abstract: Motivated by the practical consideration of the measurement of chaotic signals in experiments or the transmission of these signals through a physical medium, we investigate the effect of filtering on chaotic symbolic dynamics. We focus on the linear, time-invariant filters that are used frequently in many applications, and on the two quantities characterizing chaotic symbolic dynamics: topological entropy and bit-error rate. Theoretical consideration suggests that the topological entropy is invariant under filtering. Since computation of this entropy requires that the generating partition for defining the symbolic dynamics be known, in practical situations the computed entropy may change as a filtering parameter is changed. We find, through numerical computations and experiments with a chaotic electronic circuit, that with reasonable care the computed or measured entropy values can be preserved for a wide range of the filtering parameter. (C) 2003 American Institute of Physics.
Identifiers--KeyWord Plus(R): TIME-SERIES; GENERATING PARTITIONS; TOPOLOGICAL-ENTROPY; GENERALIZED SYNCHRONIZATION; STRANGE ATTRACTORS; CHUA CIRCUIT; HENON MAP; SYSTEMS; COMMUNICATION; SIGNALS
Cited References:
MAXIM INTEGRATED PRO, 1995
ADLER RL, 1965, V114, P309, T AM MATH SOC
AFRAIMOVICH VS, 1986, V29, P747, RADIOPHYS QUANTUM EL
BADII R, 1988, V60, P979, PHYS REV LETT
BALMFORTH NJ, 1994, V72, P80, PHYS REV LETT
BANDT C, 2002, V8817, P4102, PHYS REV LETT
BAPTISTA MS, 2000, V62, P4835, PHYS REV E A
BLOCK L, 1989, V55, P929, J STAT PHYS
BOLLT EM, 2001, V154, P259, PHYSICA D
BOLLT E, 1997, V79, P3787, PHYS REV LETT
BOLLT EM, 1997, V55, P6404, PHYS REV E A
BOLLT E, 1998, V58, P1724, PHYS REV E A
BOLLT EM, 2000, V85, P3524, PHYS REV LETT
BOWEN R, 1975, EQUILIBRIUM STATES E
BOWEN R, 1970, V92, P725, AM J MATH
GORA P, 1991, V323, P39, T AM MATH SOC
BROOMHEAD DS, 1992, V54, P373, J ROY STAT SOC B MET
CAMPBELL KM, 1996, V9, P801, NONLINEARITY
CHEN CC, 2000, V47, P1663, IEEE T CIRCUITS-I
CHENNAOUI A, 1990, V59, P1311, J STAT PHYS
CHRISTIANSEN F, 1995, V51, P3811, PHYS REV E
CHRISTIANSEN F, 1996, V9, P1623, NONLINEARITY
CHUA LO, 1994, V22, P279, INT J CIRC THEOR APP
CHUA LO, 1993, V40, P732, IEEE T CIRCUITS-I
COLLET P, 1983, V88, P257, COMMUN MATH PHYS
CVITANOVIC P, 1988, V38, P1503, PHYS REV A

DAVIES ME, 1997, V101, P195, PHYSICA D
DAVIDCHACK RL, 2000, V61, P1353, PHYS REV E
DITTO WL, 1997, V7, P509, CHAOS
ECKMANN JP, 1985, V57, P617, REV MOD PHYS
ENGBERT R, 1998, NONLINEAR TIME SERIE
FUJISAKA H, 1983, V69, P32, PROG THEOR PHYS
GIOVANNINI F, 1991, V24, P1837, J PHYS A-MATH GEN
GORA P, 1997, LAWS CHAOS INVARIANT
GRASSBERGER P, 1989, V22, P5217, J PHYS A-MATH GEN
GRASSBERGER P, 1985, V113, P235, PHYS LETT A
HAYES S, 1994, V73, P1781, PHYS REV LETT
HAYES S, 1993, V70, P3031, PHYS REV LETT
HERZEL H, 1994, V50, P5061, PHYS REV E
HUNT BR, 1996, V54, P4819, PHYS REV E
ISABELLE SH, 1992, V5, P133, ICASSP 92 P 4
KAPLAN JL, 1979, V730, LECT NOTES MATH
KENNEL MB, 2000, V61, P2563, PHYS REV E
KOCAREV L, 1996, V76, P1816, PHYS REV LETT
KURTHS J, 1995, V5, P88, CHAOS
LAI YC, 2000, V10, P787, INT J BIFURCAT CHAOS
LAI YC, 1999, V255, P75, PHYS LETT A
LEHRMAN M, 1997, V78, P1, PHYS REV LETT
LICHTENBERG AJ, 1992, REGULAR CHAOTIC DYNA
LIND D, 1995, INTRO SYMBOLIC DYNAM
LORENZ EN, 1963, V20, P130, J ATMOS SCI
MADAN R, 1993, CHUAS CIRCUIT PARADI
MATSUMOTO T, 1984, V31, P1055, IEEE T CIRCUITS SYST
MISCHAIKOW K, 1999, V82, P1144, PHYS REV LETT
MITSCHKE F, 1990, V41, P1169, PHYS REV A
NEIMAN A, 1996, V76, P4299, PHYS REV LETT
OPPENHEIM AV, 1997, SIGNALS SYSTEMS
PAOLI P, 1989, V62, P2429, PHYS REV LETT
PECORA LM, 1990, V64, P821, PHYS REV LETT
PECORA LM, 1995, V52, P3420, PHYS REV E A
PERORA LM, 2000, V10, P875, INT J BIFURCAT CHAOS
PERORA LM, 1996, V6, P432, CHAOS
PESIN JB, 1976, V17, P196, SOV MATH DOKL
ROSSLER OE, 1979, V71, P155, PHYS LETT A
RUDOLPH DJ, 1990, FUNDAMENTALS MEASURA
RULKOV NF, 1995, V51, P980, PHYS REV E
SCHIFF SJ, 1996, V54, P6708, PHYS REV E
STARK J, 1994, V143, P1, IEEE DIGEST
STEUER R, 2001, V6406, P1911, PHYS REV E 1
SUSHCHIK M, 2000, V4, P128, IEEE COMMUN LETT

1/5/90 (Item 13 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

11242198 Genuine Article#: 627UN Number of References: 19
Title: Resonance and selective communication via bursts in neurons having subthreshold oscillations
Author(s): **Izhikevich EM (REPRINT)**
Corporate Source: Inst Neurosci,10640 John Jay Hopkins Dr/San Diego//CA/92121 (REPRINT); Inst Neurosci,San Diego//CA/92121
Journal: BIOSYSTEMS, 2002, V67, N1-3 (OCT-DEC), P95-102
ISSN: 0303-2647 Publication date: 20021000
Publisher: ELSEVIER SCI LTD, THE BOULEVARD, LANGFORD LANE, KIDLINGTON, OXFORD OX5 1GB, OXON, ENGLAND
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: BIOLOGY
Abstract: Revealing the role of bursts of action potentials is an important step toward understanding how the neurons communicate. The dominant point of view is that bursts are needed to increase the reliability of communication between neurons [Trends Neurosci. 20 (1997) 38]. In this

paper we present an alternative but complementary hypothesis. We consider the effect of a short burst on a model postsynaptic cell having damped oscillation of its membrane potential. The oscillation frequency (eigenfrequency) plays a crucial role. Due to the subthreshold membrane resonance and frequency preference, the responses (i.e. voltage oscillations) of such a cell are amplified when the intra-burst frequency equals the cell's eigenfrequency. Responses are negligible, however, if the intra-burst frequency is twice the eigenfrequency. Thus, the same burst could be effective for one cell and ineffective for another depending on their eigenfrequencies. This theoretical observation suggests that, in addition to coping with unreliable synapses, bursts of action potentials may provide effective mechanisms for selective communication between neurons.

Descriptors--Author Keywords: frequency preference ; resonators ; doublet ; triplet ; burst ; Hopf bifurcation
Identifiers--KeyWord Plus(R): FREQUENCY PREFERENCES; NEOCORTICAL NEURONS; MEMBRANE RESONANCE; THALAMIC NEURONS; BEHAVIOR

Cited References:

COBB SR, 1995, V378, P75, NATURE
DESMAISONS D, 1999, V19, P10727, J NEUROSCI
GUTFREUND Y, 1995, V483, P621, J PHYSIOL-LONDON
HODGKIN AL, 1952, V117, P500, J PHYSIOL
HUTCHEON B, 1996, V76, P683, J NEUROPHYSIOL
HUTCHEON B, 1994, V71, P583, J NEUROPHYSIOL
HUTCHEON B, 2000, V23, P216, TRENDS NEUROSCI
HUTCHEON B, 1996, V76, P698, J NEUROPHYSIOL
IZHIKEVICH EM, 2001, V14, P883, NEURAL NETWORKS
IZHIKEVICH EM, 2000, V10, P1171, INT J BIFURCAT CHAOS
KUZNETSOV Y, 1995, ELEMENTS APPL BIFURC
LAMPL I, 1993, V70, P2181, J NEUROPHYSIOL
LAMPL I, 1997, V78, P325, NEUROSCIENCE
LISMAN JE, 1997, V20, P38, TRENDS NEUROSCI
LLINAS RR, 1991, V88, P897, P NATL ACAD SCI USA
MORRIS C, 1981, V35, P193, BIOPHYS J
PEDROARENA C, 1997, V94, P724, P NATL ACAD SCI USA
PUIL E, 1994, V71, P575, J NEUROPHYSIOL
SINGER W, 1999, V9, P189, CURR OPIN NEUROBIOL

1/5/91 (Item 14 from file: 34)

DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

11175936 Genuine Article#: 614EX Number of References: 15

Title: Smallest small-world network - art. no. 046139

Author(s): Nishikawa T (REPRINT) ; Motter AE; Lai YC; **Hoppensteadt FC**
Corporate Source: Arizona State Univ,Dept Math, Ctr Syst Sci & Engn Res,Tempe//AZ/85287 (REPRINT); Arizona State Univ,Dept Math, Ctr Syst Sci & Engn Res,Tempe//AZ/85287; Arizona State Univ,Dept Elect Engn,Tempe//AZ/85287

Journal: PHYSICAL REVIEW E, 2002, V6604, N4,2 (OCT), P6139-6139
ISSN: 1063-651X Publication date: 20021000
Publisher: AMERICAN PHYSICAL SOC, ONE PHYSICS ELLIPSE, COLLEGE PK, MD 20740-3844 USA
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: PHYSICS, FLUIDS & PLASMAS; PHYSICS, MATHEMATICAL

Abstract: Efficiency in passage times is an important issue in designing networks, such as transportation or computer networks. The small-world networks have structures that yield high efficiency, while keeping the network highly clustered. We show that among all networks with the small-world structure, the most efficient ones have a "single center" node, from which all shortcuts are connected to uniformly distributed nodes over the network. The networks with several centers and a connected subnetwork of shortcuts are shown to be "almost" as efficient. Genetic-algorithm simulations further support our results.

Cited References:
ALBERT R, 2000, V406, P378, NATURE
ALBERT R, 1999, V401, P130, NATURE
BARABASI AL, 1999, V286, P509, SCIENCE
BARBOUR AD, 2001, V19, P54, RANDOM STRUCT ALGOR
CANCHO RFI, CONDMAT0111222
DOROGOVTSEV SN, 2002, V51, P1079, ADV PHYS
DOROGOVTSEV SN, 2000, V50, P1, EUROPHYS LETT
LATORA V, 2001, V8719, P8701, PHYS REV LETT
MATHIAS N, 2001, V6302, P1117, PHYS REV E 1
MITCHELL M, 1996, INTRO GENETIC ALGORI
NEWMAN MEJ, 2000, V84, P3201, PHYS REV LETT
NEWMAN MEJ, 2001, V98, P404, P NATL ACAD SCI USA
WAGNER A, 2001, V268, P1803, P ROY SOC LOND B BIO
WATTS DJ, 1999, SMALL WORLDS DYNAMIC
WATTS DJ, 1998, V393, P440, NATURE

1/5/92 (Item 15 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

10052742 Genuine Article#: 479RL Number of References: 27
Title: Resonate-and-fire neurons
Author(s): **Izhikevich EM (REPRINT)**
Corporate Source: Inst Neurosci,10640 John Jay Hopkins Dr/San Diego//CA/92121 (REPRINT); Inst Neurosci,San Diego//CA/92121
Journal: NEURAL NETWORKS, 2001, V14, N6-7,SI (JUL-SEP), P883-894
ISSN: 0893-6080 Publication date: 20010700
Publisher: PERGAMON-ELSEVIER SCIENCE LTD, THE BOULEVARD, LANGFORD LANE, KIDLINGTON, OXFORD OX5 1GB, ENGLAND
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE
Abstract: We suggest a simple spiking model-resonate-and-fixe neuron, which is similar to the integrate-and-fire neuron except that the state variable is complex. The model provides geometric illustrations to many interesting phenomena occurring in biological neurons having subthreshold damped oscillations of membrane potential. For example, such neurons prefer a certain resonant frequency of the input that is nearly equal to their eigenfrequency, they can be excited or inhibited by a doublet (two pulses) depending on its interspike interval, and they can fire in response to an inhibitory input. All these properties could be observed in Hodgkin-Huxley-type models. We use the resonate-and-fire model to illustrate possible sensitivity of biological neurons to the fine temporal structure of the input spike train. Being an analogue of the integrate-and-fire model, the resonate-and-fire model is computationally efficient and suitable for simulations of large networks of spiking neurons. (C) 2001 Elsevier Science Ltd. All rights reserved.
Descriptors--Author Keywords: pulse-coupled neurons ; spikes ; resonance ; FM interactions ; Andronov-Hopf bifurcation
Identifiers--KeyWord Plus(R): SUBTHRESHOLD MEMBRANE RESONANCE; FREQUENCY PREFERENCES; NEOCORTICAL NEURONS; THALAMIC NEURONS; OSCILLATIONS; MODEL; BEHAVIOR
Cited References:
ABELES M, 1991, CORTICONICS NEURAL C
CONNOR JA, 1977, V18, P81, BIOPHYS J
FITZHUGH R, 1969, P1, BIOL ENG
GUTFREUND Y, 1995, V483, P621, J PHYSIOL-LONDON
GUTTMAN R, 1980, V305, P377, J PHYSIOL-LONDON
HODGKIN AL, 1952, V117, P500, J PHYSIOL
HOPFIELD JJ, 1995, V376, P33, NATURE
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
HOPPENSTEADT FC, 1998, V48, P85, BIOSYSTEMS
HUTCHEON B, 1996, V76, P683, J NEUROPHYSIOL
HUTCHEON B, 1996, V76, P698, J NEUROPHYSIOL

HUTCHEON B, 2000, V23, P216, TRENDS NEUROSCI
HUTCHEON B, 1994, V71, P583, J NEUROPHYSIOL
IZHIKEVICH EM, 2000, V10, P1171, INT J BIFURCAT CHAOS
JANSEN H, 1994, V666, P9, BRAIN RES
JOHNSTON D, 1995, FDN CELLULAR NEUROPH
LAMPL I, 1993, V70, P2181, J NEUROPHYSIOL
LAMPL I, 1997, V78, P325, NEUROSCIENCE
LLINAS RR, 1988, V242, P1654, SCIENCE
LLINAS RR, 1991, V88, P897, P NATL ACAD SCI USA
LUK WK, 2000, V82, P455, BIOL CYBERN
MANOR Y, 1997, V77, P2736, J NEUROPHYSIOL
MORRIS C, 1981, V35, P193, BIOPHYS J
PEDROARENA C, 1997, V94, P724, P NATL ACAD SCI USA
PIKE FG, 2000, V529, P205, J PHYSIOL-LONDON
PUIL E, 1994, V71, P575, J NEUROPHYSIOL
RINZEL J, 1989, METHODS NEURONAL MOD

1/5/93 (Item 16 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

09730963 Genuine Article#: 440PD Number of References: 38
Title: Synchronization of elliptic bursters
Author(s): **Izhikevich EM (REPRINT)**
Corporate Source: Inst Neurosci,10640 John Jay Hopkins Dr/San Diego//CA/92121 (REPRINT); Inst Neurosci,San Diego//CA/92121
Journal: SIAM REVIEW, 2001, V43, N2 (JUN), P315-344
ISSN: 0036-1445 Publication date: 20010600
Publisher: SIAM PUBLICATIONS, 3600 UNIV CITY SCIENCE CENTER, PHILADELPHIA, PA 19104-2688 USA
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: MATHEMATICS, APPLIED
Abstract: Periodic bursting behavior in neuron is a recurrent transition between a quiescent state and repetitive spiking. When the transition to repetitive spiking occurs via a subcritical Andronov-Hopf bifurcation and the transition to the quiescent state occurs via fold limit cycle bifurcation, the burster is said to be of elliptic type (also know as a "subHopf/fold cycle" burster). Here we study the synchronization dynamics of weakly connected networks of such bursters. We find that the behavior of such networks is quite different from the behavior of weakly connected phase oscillators and resembles that of strongly connected relaxation oscillators. As a result, such weakly connected bursters need few (usually one) bursts to synchronize, and synchronization is possible for bursters having quite different quantitative features. We also find that interactions between bursters depend crucially on the spiking frequencies. Namely, the interaction are most effective when the presynaptic interspike frequency matches the frequency of postsynaptic oscillations. Finally, we use the FitzHugh Rinzel, Morris-Lecar, and Hodgkin-Huxley models to illustrate our major results.
Descriptors--Author Keywords: subcritical elliptic burster ; normal form ; slow passage effect ; fast threshold modulation ; FM interactions
Identifiers--KeyWord Plus(R): CONNECTED NEURAL OSCILLATORS; SINGULAR HOPF-BIFURCATION; RELAXATION OSCILLATIONS; SYNAPTIC ORGANIZATIONS; DYNAMICAL PROPERTIES; MODEL; BRAIN
Cited References:
ARNOLD VI, 1994, V5, DYNAMICAL SYSTEMS
BAER SM, 1992, V52, P1651, SIAM J APPL MATH
BAER SM, 1989, V49, P55, SIAM J APPL MATH
BAER SM, 1986, V46, P721, SIAM J APPL MATH
BELAIR J, 1984, V42, P193, Q APPL MATH
BERTRAM R, 1995, V57, P413, B MATH BIOL
BORISYUK RM, 1992, V66, P319, BIOL CYBERN
ECKHAUS W, 1983, V985, P432, LECT NOTES MATH
ERMENTROUT GB, 1986, V46, P233, SIAM J APPL MATH

ERMENTROUT GB, 1986, V78, P265, MATH BIOSCI
FITZHUGH R, 1961, V1, P445, BIOPHYS J
GRASMAN J, 1987, ASYMPTOTIC METHODS R
HODGKIN AL, 1954, V117, P500, J PHYSIOL-LONDON
HOPPENSTEADT FC, 1996, V75, P117, BIOL CYBERN
HOPPENSTEADT FC, 1996, V75, P129, BIOL CYBERN
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
HOPPENSTEADT FC, 1998, V48, P85, BIOSYSTEMS
IZHIKEVICH EM, 1999, V59, P2193, SIAM J APPL MATH
IZHIKEVICH EM, 1998, SUPERCRITICAL ELLIPT
IZHIKEVICH EM, 2000, V10, P1171, INT J BIFURCAT CHAOS
IZHIKEVICH EM, 2000, V60, P503, SIAM J APPL MATH
IZHIKEVICH EM, 2000, V60, P1789, SIAM J APPL MATH
KOPELL N, 1995, V33, P261, J MATH BIOL
KOPELL N, 1995, BRAIN THEORY NEURAL
KUZNETSOV Y, 1995, ELEMENTS APPL BIFURC
LLINAS RR, 1988, V242, P1654, SCIENCE
MCNAUGHTON BL, 1981, V46, P952, J NEUROPHYSIOL
MORRIS C, 1981, V35, P193, BIOPHYS J
NEJSHTADT A, 1985, V40, P190, USP MAT NAUK
PEDROARENA CM, 1999, V82, P1465, J NEUROPHYSIOL
RINZEL J, 1987, V71, MATH TOPICS POPULATI
RINZEL J, 1987, V25, P653, J MATH BIOL
SOMERS D, 1995, V89, P169, PHYSICA D
SOMERS D, 1993, V68, P393, BIOL CYBERN
STORTI DW, 1986, V46, P56, SIAM J APPL MATH
WANG XJ, 1995, BRAIN THEORY NEURAL
WILLIAMS TL, 1995, BRAIN THEORY NEURAL
WU HY, 1997, V36, P569, J MATH BIOL

1/5/94 (Item 17 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

09675072 Genuine Article#: 432ZL Number of References: 28
Title: Phase clustering and transition to phase synchronization in a large number of coupled nonlinear oscillators - art. no. 055201
Author(s): Liu ZH (REPRINT) ; Lai YC; **Hoppensteadt FC**
Corporate Source: Arizona State Univ,Dept Math,Tempe//AZ/85287 (REPRINT); Arizona State Univ,Dept Math,Tempe//AZ/85287; Arizona State Univ,Ctr Syst Sci & Engn Res, Dept Elect Engn,Tempe//AZ/85287; Arizona State Univ,Dept Phys & Astron,Tempe//AZ/85287
Journal: PHYSICAL REVIEW E, 2001, V6305, N5,2 (MAY), P5201-+
ISSN: 1063-651X Publication date: 20010500
Publisher: AMERICAN PHYSICAL SOC, ONE PHYSICS ELLIPSE, COLLEGE PK, MD 20740-3844 USA
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: PHYSICS, FLUIDS & PLASMAS; PHYSICS, MATHEMATICAL
Abstract: The transition to phase synchronization in systems consisting of a large number (N) of coupled nonlinear oscillators via the route of phase clustering (phase synchronization among subsets of oscillators) is investigated. We elucidate the mechanism for the merger of phase clusters and find an algebraic scaling between the critical coupling parameter required for phase synchronization and N. Our result implies that, in realistic situations, phase clustering may be more prevalent than full phase synchronization.
Identifiers--KeyWord Plus(R): CHAOTIC OSCILLATORS; SYSTEMS; BIFURCATION
Cited References:
ANDRADE V, 2000, V61, P3230, PHYS REV E
BLASIUS B, 1999, V399, P354, NATURE
ERGOD, 1985, V5, P341, THEORY DYN SYST
FUJIGAKI H, 1996, V53, P3192, PHYS REV E A
GREBOGI C, 1983, V50, P935, PHYS REV LETT
HOPPENSTEADT F, 1997, WEAKLY CONNECTED NEU
HOROWITZ P, 1989, ART ELECT

HU BB, 2000, V61, PR1001, PHYS REV E
KURAMOTO Y, 1974, V79, P223, PROG THEOR PHYS SUPP
LAI YC, 1996, V77, P55, PHYS REV LETT
LEE KJ, 1998, V81, P321, PHYS REV LETT
LIU ZH, 1997, V56, P7297, PHYS REV E
MAKARENKO V, 1998, V26, P15747, P NATL ACAD SCI U S
NEIMAN A, 1999, V83, P4896, PHYS REV LETT
PALUS M, 1997, V235, P341, PHYS LETT A
PARLITZ U, 1996, V54, P2115, PHYS REV E
PIKOVSKY AS, 1996, V34, P165, EUROPHYS LETT
PIKOVSKY AS, 1997, V104, P219, PHYSICA D
POSTNOV DE, 1999, V83, P1942, PHYS REV LETT
POSTNOV DE, 1999, V9, P227, CHAOS
ROSA E, 1998, V80, P1642, PHYS REV LETT
ROSENBLUM MG, 1996, V76, P1804, PHYS REV LETT
ROSSLER OE, 1979, V71, P155, PHYS LETT A
SCHAFER C, 1998, V392, P239, NATURE
SHUAI JW, 1999, V264, P289, PHYS LETT A
TASS P, 1998, V81, P3291, PHYS REV LETT
YALCINKAYA T, 1997, V79, P3885, PHYS REV LETT
ZHENG ZG, 1998, V81, P5318, PHYS REV LETT

1/5/95 (Item 18 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

09467581 Genuine Article#: 407KU Number of References: 34
Title: Oscillatory model of novelty detection
Author(s): Borisyuk R (REPRINT) ; Denham M; **Hoppensteadt F** ; Kazanovich A; Vinogradova O
Corporate Source: Univ Plymouth,Sch Comp, Ctr Neural & Adapt Syst,Plymouth PL4 8AA/Devon/England/ (REPRINT); Univ Plymouth,Sch Comp, Ctr Neural & Adapt Syst,Plymouth PL4 8AA/Devon/England/; Russian Acad Sci,Inst Math Problems Biol,Pushchino 142290//Russia/; Arizona State Univ,Ctr Syst Sci,Tempe//AZ/85287; Russian Acad Sci,Inst Theoret & Expt Biophys,Pushchino 142290//Russia/
Journal: NETWORK-COMPUTATION IN NEURAL SYSTEMS, 2001, V12, N1 (FEB), P1-20
ISSN: 0954-898X Publication date: 20010200
Publisher: IOP PUBLISHING LTD, DIRAC HOUSE, TEMPLE BACK, BRISTOL BS1 6BE, ENGLAND
Language: English Document Type: ARTICLE
Geographic Location: England; Russia; USA
Journal Subject Category: COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE; ENGINEERING, ELECTRICAL & ELECTRONIC; NEUROSCIENCES
Abstract: A model of novelty detection is developed which is based on an oscillatory mechanism of memory formation and information processing. The frequency encoding of the input information and adaptation of natural frequencies of network oscillators to the frequency of the input signal are used as the mechanism of information storage. The resonance amplification of network activity is used as a recognition principle for familiar stimuli. Application of the model to novelty detection in the hippocampus is discussed.
Identifiers--KeyWord Plus(R): NEURAL-NETWORK; HIPPOCAMPAL INTERACTIONS; CENTRAL ELEMENT; VISUAL-CORTEX; THETA-RHYTHM; PHASE; SYNCHRONIZATION; PATTERNS; INFORMATION; FREQUENCIES
Cited References:
BORISYUK RM, 1997, V40, P3, BIOSYSTEMS
BORISYUK R, 1999, V81, P359, BIOL CYBERN
BORISYUK RM, 1998, V48, P3, BIOSYSTEMS
CARPENTER GA, 1987, V35, P54, COMPUT VIS GRAPH IMA
CARPENTER GA, 1987, V26, P4919, APPL OPTICS
DAIDO H, 1988, V61, P231, PHYS REV LETT
DENHAM MJ, 2000, V10, P698, HIPPOCAMPUS
EICHENBAUM H, 1999, V9, PR482, CURR BIOL
ERMENTROUT B, 1994, V6, P225, NEURAL COMPUT
GROSSBERG S, 1999, V12, P163, SPATIAL VISION

HOPPENSTEADT F, 1986, INTRO MATH NEURONS
HOPPENSTEADT F, 1997, WEAKLY CONNECTED NEU
HOPPENSTEADT FC, 1998, V48, P85, BIOSYSTEMS
HOPPENSTEADT F, 1992, V34, P426, SIAM REV
IIJIMA T, 1996, V272, P1176, SCIENCE
KAMMEN M, 1990, P273, MODELS BRAIN FUNCTIO
KAZANOVICH YB, 1994, V71, P177, BIOL CYBERN
KAZANOVICH YB, 1999, V12, P441, NEURAL NETWORKS
KIRK IJ, 1998, V22, P291, NEUROSCI BIOBEHAV R
KURAMOTO Y, 1987, V49, P569, J STAT PHYS
KURAMOTO Y, 1992, V87, P1119, PROG THEOR PHYS
MILLER R, 1991, CORTICOHIPPOCAMPAL I
OKEEFE J, 1993, V3, P317, HIPPOCAMPUS
SCHUSTER HG, 1990, V64, P83, BIOL CYBERN
SINGER W, 1995, V18, P555, ANNU REV NEUROSCI
SOKOLOV EN, 1975, P17, NEURONAL MECH ORIENT
SOMPOLINSKY H, 1990, V87, P7200, P NATL ACAD SCI USA
SQUIRE LR, 1992, V99, P195, PSYCHOL REV
STROGATZ SH, 1988, V31, P143, PHYSICA D
THATCHER RW, 1977, V1, FDN COGNITIVE PROCES
TORRAS C, 1986, V16, P680, IEEE T SYST MAN CYB
UKHTOMSKY AA, 1978, P107, COLLECT WORKS
VINOGRADOVA OS, 1995, V45, P523, PROG NEUROBIOL
WU Z, 1999, V3, P205, BIOL CYBERN

1/5/96 (Item 19 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

09464434 Genuine Article#: 408TU Number of References: 18
Title: Mathematical models and simulations of bacterial growth and chemotaxis in a diffusion gradient chamber
Author(s): Chiu C (REPRINT) ; **Hoppensteadt FC**
Corporate Source: Michigan State Univ,Dept Math,E Lansing//MI/48824 (REPRINT); Michigan State Univ,Dept Math,E Lansing//MI/48824; Arizona State Univ,Ctr Syst Sci & Engn,Tempe//AZ/85287
Journal: JOURNAL OF MATHEMATICAL BIOLOGY, 2001, V42, N2 (FEB), P120-144
ISSN: 0303-6812 Publication date: 20010200
Publisher: SPRINGER-VERLAG, 175 FIFTH AVE, NEW YORK, NY 10010 USA
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: BIOLOGY, MISCELLANEOUS; MATHEMATICS, MISCELLANEOUS
Abstract: The diffusion gradient chamber (DGC) is a novel device developed to study the response of chemotactic bacteria to combinations of nutrients and attractants [7]. Its purpose is to characterize genetic variants that occur in many biological experiments. In this paper, a mathematical model which describes the spatial distribution of a bacterial population within the DGC is developed. Mathematical analysis of the model concerning positivity and boundedness of the solutions are given. An ADI (Alternating Direction Implicit) method is constructed for finding numerical solutions of the model and carrying out computer simulations. The numerical results of the model successfully reproduced the patterns that were observed in the experiments using the DGC.
Descriptors--Author Keywords: mathematical models for bacterial cell populations ; reaction-diffusion-chemotaxis equations ; ADI methods ; computer simulation
Identifiers--KeyWord Plus(R): CELL-POPULATIONS; PATTERNS; SYSTEMS
Cited References:
BERG HC, 1988, V53, COLD SPRING HARBOR S
BRITTON NE, 1986, REACTION DIFFUSION E
BUDRENE EO, 1991, V349, P630, NATURE
CHIU C, 1998, V56, P89, Q APPL MATH
CHIU C, 1997, V34, P1185, SIAM J NUMER ANAL
CHIU CC, 1994, V32, P841, J MATH BIOL
EMERSON D, 1994, APPL ENV MICROBIOLOG

FORD RM, 1992, V52, P1426, SIAM J APPL MATH
FRYMIER PD, 1994, V48, P687, CHEM ENG SCI
KELLER EF, 1971, V30, P235, J THEOR BIOL
MACNAB RM, 1987, V1, P732, ESCHERICHIA COLI SAL
MONOD J, 1942, RECHERCHES CROISSANC
MURRAY JD, 1989, BIOMATHEMATICS TEXTS
ODUM HT, 1981, ENERGY BASIS HUMAN N
PEACEMAN DW, 1955, V3, P28, J SOC IND APPL MATH
PROTTER MH, 1967, MAXIMUM PRINCIPLES D
RIVERO MA, 1989, V44, P2881, CHEM ENG SCI
WIDMAN MT, 1997, V55, BIOTECHNOLOGY BIOENG

1/5/97 (Item 20 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

09438175 Genuine Article#: 404XE Number of References: 19
Title: Synchronization of MEMS resonators and mechanical neurocomputing
Author(s): **Hoppensteadt FC (REPRINT) ; Izhikevich EM**
Corporate Source: Arizona State Univ,Ctr Syst Sci & Engn,Tempe//AZ/85287 (REPRINT); Arizona State Univ,Ctr Syst Sci & Engn,Tempe//AZ/85287; Inst Neurosci,San Diego//CA/92121
Journal: IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS I-FUNDAMENTAL THEORY AND APPLICATIONS, 2001, V48, N2 (FEB), P133-138
ISSN: 1057-7122 Publication date: 20010200
Publisher: IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC, 345 E 47TH ST, NEW YORK, NY 10017-2394 USA
Language: English Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: ENGINEERING, ELECTRICAL & ELECTRONIC
Abstract: We combine here two well-known and established concepts: mic microelectromechanical systems (MEMS) and neurocomputing. First, we consider MEMS oscillators having low amplitude activity and we derive a simple mathematical model that describes nonlinear phase-locking dynamics in them. Then, we investigate a theoretical possibility of using RIF,RIS oscillators to build an oscillatory neurocomputer hating autocorrelative associative memory The neurocomputer stores and retrieves complex oscillatory patterns in the form of synchronized states with appropriate phase relations between the oscillators. Thus, we show that MEMS alone can be used to build a sophisticated information processing system (U.S, provisional patent 60/178,654).
Descriptors--Author Keywords: Andronov-Hopf bifurcation ; mu resonators ; neural networks ; oscillatory associative memory ; smart matter
Identifiers--KeyWord Plus(R): CONNECTED NEURAL OSCILLATORS; SYNAPTIC ORGANIZATIONS; DYNAMICAL PROPERTIES; COUPLED OSCILLATORS; ASSOCIATIVE MEMORY; PHASE INFORMATION; NETWORKS
Cited References:
AOYAGI T, 1995, V74, P4075, PHYS REV LETT
ARBIB MA, 1995, BRAIN THEORY NEURAL
ARONSON DG, 1990, V41, P403, PHYSICA D
COHEN MA, 1983, V13, P815, IEEE T SYST MAN CYB
GUCKENHEIMER J, 1983, NONLINEAR OSCILLATIO
HOPPENSTEADT FC, 2000, V62, P4010, PHYS REV E B
HOPPENSTEADT FC, 1999, V82, P2983, PHYS REV LETT
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
HOPPENSTEADT FC, 2000, V11, P734, IEEE T NEURAL NETWOR
HOPPENSTEADT FC, 1996, V75, P117, BIOL CYBERN
HOPPENSTEADT FC, 1996, V75, P129, BIOL CYBERN
IZHIKEVICH EM, UNPUB NEURAL NETWORK
IZHIKEVICH EM, 1999, V10, P508, IEEE T NEURAL NETWOR
KUZNETSOV Y, 1995, ELEMENTS APPL BIFURC
MASON A, 1998, V86, P1733, P IEEE
NGUYEN CTC, 1998, P1, P IEEE MEMS WORKSH H
NGUYEN CT, 1995, P489, P 1995 IEEE INT ULTR
NGUYEN CTC, 1999, V34, P440, IEEE J SOLID-ST CIRC
YAZDI N, 1998, V86, P1640, P IEEE

1/5/98   (Item 21 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

09251824   Genuine Article#: 384PG   Number of References: 18
Title: An oscillatory neural network model of sparse distributed memory and novelty detection
Author(s): Borisyuk R (REPRINT) ; Denham M; **Hoppensteadt F** ; Kazanovich Y; Vinogradova O
Corporate Source: Univ Plymouth,Sch Comp, Ctr Neural & Adapt Syst,Drake Circus/Plymouth PL4 8AA/Devon/England/ (REPRINT); Univ Plymouth,Sch Comp, Ctr Neural & Adapt Syst,Plymouth PL4 8AA/Devon/England/; Arizona State Univ,Ctr Syst Sci,Tempe//AZ/85287; Russian Acad Sci,Inst Math Problems Biol,Pushchino 142290//Russia/; Russian Acad Sci,Inst Theoret & Expt Biophys,Pushchino 142290//Russia/
Journal: BIOSYSTEMS, 2000, V58, N1-3 (OCT-DEC), P265-272
ISSN: 0303-2647   Publication date: 20001000
Publisher: ELSEVIER SCI IRELAND LTD, CUSTOMER RELATIONS MANAGER, BAY 15, SHANNON INDUSTRIAL ESTATE CO, CLARE, IRELAND
Language: English   Document Type: ARTICLE
Geographic Location: England; USA; Russia
Journal Subject Category: BIOLOGY
Abstract: A model of sparse distributed memory is developed that is based on phase relations between the incoming signals and an oscillatory mechanism for information processing. This includes phase-frequency encoding of input information, natural frequency adaptation among the network oscillators for storage of input signals, and a resonance amplification mechanism that responds to familiar stimuli. Simulations of this model show different types of dynamics in response to new and familiar stimuli. The application of the model to hippocampal working memory is discussed. (C) 2000 Elsevier Science Ireland Ltd. All rights reserved.
Descriptors--Author Keywords: synchronisation ; memory formation ; frequency adaptation
Identifiers--KeyWord Plus(R): CENTRAL ELEMENT; HIPPOCAMPUS; PATTERNS
Cited References:
AMARAL DG, 1995, P443, RAT NERVOUS SYSTEM
BORISYUK R, 1999, V81, P359, BIOL CYBERN
BORISYUK R, 2000, V1, P145, 2 RUSS C NEUR 2000
BORISYUK RM, 1998, V48, P3, BIOSYSTEMS
DAMASIO AR, 1989, V1, P123, NEURAL COMPUT
ERMENTROUT B, 1994, V6, P225, NEURAL COMPUT
HOPPENSTEADT F, 1992, V34, P426, SIAM REV
HOPPENSTEADT F, 1997, INTRO MATH NEURONS
HOPPENSTEADT F, 1997, WEAKLY CONNECTED NEU
IIJIMA T, 1996, V272, P1176, SCIENCE
KAZANOVICH YB, 1999, V12, P441, NEURAL NETWORKS
KAZANOVICH YB, 1994, V71, P177, BIOL CYBERN
MILLER R, 1991, CORTICOHIPPOCAMPAL I
SQUIRE LR, 1992, V99, P195, PSYCHOL REV
THATCHER RW, 1977, FDN COGNITIVE PROCES
TORRAS C, 1986, V16, P680, IEEE T SYST MAN CYB
UKHTOMSKY AA, 1978, P107, COLLECT WORKS
VINOGRADOVA OS, 1995, V45, P523, PROG NEUROBIOL

1/5/99   (Item 22 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

09022326   Genuine Article#: 356ML   Number of References: 18
Title: Synchronization of laser oscillators, associative memory, and optical neurocomputing
Author(s): **Hoppensteadt FC (REPRINT)** ; **Izhikevich EM**
Corporate Source: ARIZONA STATE UNIV,CTR SYST SCI & ENGN/TEMPE//AZ/85287

(REPRINT)
Journal: PHYSICAL REVIEW E, 2000, V62, N3,B (SEP), P4010-4013
ISSN: 1063-651X   Publication date: 20000900
Publisher: AMERICAN PHYSICAL SOC, ONE PHYSICS ELLIPSE, COLLEGE PK, MD 20740-3844
Language: English   Document Type: ARTICLE
Geographic Location: USA
Subfile: CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: PHYSICS, MATHEMATICAL; PHYSICS, FLUIDS & PLASMAS
Abstract: We investigate here possible neurocomputational features of networks of laser oscillators. Our approach is similar to classical optical neurocomputing where artificial neurons are lasers and connection matrices are holographic media. However, we consider oscillatory neurons communicating via phases rather than amplitudes. Memorized patterns correspond to synchronized states where the neurons oscillate with equal frequencies and with prescribed phase relations. The mechanism of recognition is related to phase locking.
Identifiers--KeyWord Plus(R): CONNECTED NEURAL OSCILLATORS; SYNAPTIC ORGANIZATIONS; SEMICONDUCTOR-LASERS; DYNAMICAL PROPERTIES; INJECTION; BRAIN
Cited References:
ABBOTT LF, 1990, V23, P3835, J PHYS A-MATH GEN
ARBIB MA, 1995, BRAIN THEORY NEURAL
HOHL A, 1997, V78, P4745, PHYS REV LETT
HOPPENSTEADT FC, 1996, V75, P117, BIOL CYBERN
HOPPENSTEADT FC, 1996, V75, P129, BIOL CYBERN
HOPPENSTEADT FC, 1998, V48, P85, BIOSYSTEMS
HOPPENSTEADT FC, 1999, V82, P2983, PHYS REV LETT
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
IZHIKEVICH EM, 1998, V58, P905, PHYS REV E
IZHIKEVICH EM, 1999, V59, P2193, SIAM J APPL MATH
IZHIKEVICH EM, UNPUB
JENKINS BK, 1995, BRAIN THEORY NEURAL
KURAMOTO Y, 1984, CHEM OSCILLATIONS WA
LANG R, 1980, V16, P347, IEEE J QUANTUM ELECT
VARANGIS PM, 1997, V78, P2353, PHYS REV LETT
WAGNER K, 1993, V32, P1249, APPL OPTICS
WASSERMAN PD, 1989, NEURAL COMPUTING THE
YEUNG MKS, 1998, V58, P4421, PHYS REV E

1/5/100 (Item 23 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

08956165   Genuine Article#: 349HF   Number of References: 111
Title: Neural excitability, spiking and bursting
Author(s): **Izhikevich EM (REPRINT)**
Corporate Source: INST NEUROSCI,1640 JOHN JAY HOPKINS DR/SAN DIEGO//CA/92121 (REPRINT); ARIZONA STATE UNIV,CTR SYST SCI & ENGN/TEMPE//AZ/85287
Journal: INTERNATIONAL JOURNAL OF BIFURCATION AND CHAOS, 2000, V10, N6 (JUN), P1171-1266
ISSN: 0218-1274   Publication date: 20000600
Publisher: WORLD SCIENTIFIC PUBL CO PTE LTD, JOURNAL DEPT PO BOX 128 FARRER ROAD, SINGAPORE 912805, SINGAPORE
Language: English   Document Type: REVIEW
Geographic Location: USA
Subfile: CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS, APPLIED; MULTIDISCIPLINARY SCIENCES
Abstract: Bifurcation mechanisms involved in the generation of action potentials (spikes) by neurons are reviewed here. We show how the type of bifurcation determines the neuro-computational properties of the cells. For example, when the rest state is near a saddle-node bifurcation, the cell can fire all-or-none spikes with an arbitrary low frequency, it has a well-defined threshold manifold, and it acts as an integrator; i.e. the higher the frequency of incoming pulses, the

sooner it fires. In contrast, when the rest state is near an Andronov-Hopf bifurcation, the cell fires in a certain frequency range, its spikes are not all-or-none, it does not have a well-defined threshold manifold, it call fire in response to an inhibitory pulse; and it acts as a resonator; i.e. it responds preferentially to a certain (resonant) frequency of the input. Increasing the input frequency may actually delay or terminate its firing.

We also describe the phenomenon of neural bursting, and we use geometric bifurcation theory to extend the existing classification of bursters, including many new types. We discuss how the type of burster defines its neuro-computational properties, and we show that different bursters can interact, synchronize and process information differently.

Identifiers--KeyWord Plus(R): HODGKIN-HUXLEY EQUATIONS; COUPLED OSCILLATORS; PERIODIC-SOLUTIONS; SLOW PASSAGE; RELAXATION-OSCILLATORS; HOPF-BIFURCATION; THALAMIC NEURONS; FM INTERACTIONS; MODEL NEURONS; FREQUENCY

Cited References:

ABARBANEL HDI, 1996, V8, P1567, NEURAL COMPUT
ALEXANDER JC, 1991, V29, P405, J MATH BIOL
ALEXANDER JC, 1990, V50, P1373, SIAM J APPL MATH
ANROLD VI, 1994, DYNAMICAL SYSTEMS 5
ARNOLD VI, 1982, GEOMETRICAL METHODS
ARONSON DG, 1990, V41, P403, PHYSICA D
BAER SM, 1995, V33, P309, J MATH BIOL
BAER SM, 1989, V49, P55, SIAM J APPL MATH
BEDROV YA, 1992, V66, P413, BIOL CYBERN
BELAIR J, 1984, V42, P193, Q APPL MATH
BERTRAM R, 1995, V57, P413, B MATH BIOL
BERTRAM R, 1993, V69, P257, BIOL CYBERN
BOOTH V, 1997, V57, P1406, SIAM J APPL MATH
BUTERA RJ, 1997, V77, P307, BIOL CYBERN
BUTERA RJ, 1996, V3, P199, J COMPUT NEUROSCI
CANAVIER CC, 1991, V66, P2107, J NEUROPHYSIOL
CARPENTER GA, 1979, V36, P334, SIAM J APPL MATH
CHAY TR, 1983, V42, P181, BIOPHYS J
CONNOR JA, 1971, V214, P31, J PHYSIOL-LONDON
DELNEGRO CA, 1998, V75, P174, BIOPHYS J
DEVRIES G, 1998, V8, P281, J NONLINEAR SCI
ERMENTROUT B, 1998, V10, P1721, NEURAL COMPUT
ERMENTROUT GB, 1986, V78, P265, MATH BIOSCI
ERMENTROUT GB, 1996, V8, P979, NEURAL COMPUT
ERMENTROUT GB, 1986, V46, P233, SIAM J APPL MATH
EVANS J, 1982, V42, P219, SIAM J A MA
FENICHEL N, 1971, V21, P193, INDIANA U MATH J
FEROE JA, 1982, V42, P235, SIAM J A MA
FITZHUGH R, 1955, V17, P257, B MATH BIOPHYS
FRANKEL P, 1993, V53, P1436, SIAM J APPL MATH
GRASMAN J, 1987, ASYMPTOTIC METHODS R
GUCKENHEIMER J, 1997, V4, P257, J COMPUT NEUROSCI
GUTFREUND Y, 1995, V483, P621, J PHYSIOL-LONDON
GUTKIN BS, 1998, V10, P1047, NEURAL COMPUT
HANSEL D, 1995, V7, P307, NEURAL COMPUT
HASSARD B, 1978, V71, P401, J THEOR BIOL
HASSARD BS, 1981, THEORY APPL HOPF BIF
HASTINGS SP, 1976, V27, P123, QUART J MATH
HINDMARSH JL, 1984, V221, P87, P ROY SOC LOND B BIO
HODGKIN AL, 1952, V117, P500, J PHYSIOL
HODGKIN AL, 1948, V107, P165, J PHYSIOL-LONDON
HOLDEN AV, 1991, V1, P96, P 9 SUMM WORKSH MATH
HOLDEN L, 1993, V31, P351, J MATH BIOL
HOLDEN L, 1993, V53, P1045, SIAM J APPL MATH
HOPPENSTEADT FC, 1993, ANAL SIMULATIONS CHA
HOPPENSTEADT FC, 1996, V75, P117, BIOL CYBERN
HOPPENSTEADT FC, 1998, V48, P85, BIOSYSTEMS
HOPPENSTEADT FC, 1997, INTRO MATH NEURONS M
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU

HUTCHEON B, 1994, V71, P583, J NEUROPHYSIOL
HUTCHEON B, 1996, V76, P698, J NEUROPHYSIOL
ILIASHENKO IS, 1999, V66, MATH SURVEYS MONOGRA
IZHIKEVICH EM, 1999, V10, P499, IEEE T NEURAL NETWOR
IZHIKEVICH EM, 1999, V10, P508, IEEE T NEURAL NETWOR
IZHIKEVICH EM, 2000, IN PRESS SIAM J APPL
IZHIKEVICH EM, 1999, V59, P2193, SIAM J APPL MATH
IZHIKEVICH EM, 2000, V60, P503, SIAM J APPL MATH
IZHIKEVICH EM, 1998, SUPERCRITICAL ELLIPT
IZHIKEVICH EM, 2001, UNPUB NEURAL NETWORK
JANSEN H, 1994, V666, P9, BRAIN RES
JOHNSTON D, 1995, FDN CELLULAR NEUROPH
KOPELL N, 1995, V33, P261, J MATH BIOL
KOWALSKI JM, 1992, V5, P805, NEURAL NETWORKS
KUZNETSOV Y, 1995, ELEMENTS APPL BIFURC
LEVI M, 1978, P167, Q APPL MATH
LLINAS RR, 1991, V88, P897, P NATL ACAD SCI USA
LLINAS RR, 1988, V242, P1654, SCIENCE
MISHCHENKO EF, 1994, ASYMPTOTIC METHODS S
MORRIS C, 1981, V35, P193, BIOPHYS J
NEJSHTADT A, 1985, V40, P190, USP MAT NAUK
PERNAROWSKI M, 1992, V52, P1627, SIAM J APPL MATH
PERNAROWSKI M, 1994, V54, P814, SIAM J APPL MATH
PLANT RE, 1981, V11, P15, J MATH BIOL
PUIL E, 1994, V71, P575, J NEUROPHYSIOL
RINZEL J, 1987, V25, P653, J MATH BIOL
RINZEL J, 1986, LECT NOTES BIOMATHEM
RINZEL J, 1987, V71, LECT NOTES BIOMATHEM
RINZEL J, 1980, V49, P27, MATH BIOSCI
RINZEL J, 1989, METHODS NEURONAL MOD
RUSH ME, 1995, V57, P899, B MATH BIOL
RUSH ME, 1994, V71, P281, BIOL CYBERN
SAMOILENKO AM, 1991, V71, MATH ITS APPL SOVIET
SCHECTER S, 1987, V18, P1142, SIAM J MATH ANAL
SHARP AA, 1993, V69, P992, J NEUROPHYSIOL
SHEPHERD GM, 1983, NEUROBIOLOGY
SHEPHERD GM, 1981, NEURONES IMPULSES
SHORTEN PR, 2000, IN PRESS B MATH BIOL
SIVAN E, 1995, V72, P455, BIOL CYBERN
SMOLEN P, 1993, V53, P861, SIAM J APPL MATH
SOFTKY WR, 1993, V13, P334, J NEUROSCI
SOMERS D, 1993, V68, P393, BIOL CYBERN
SOMERS D, 1995, V89, P169, PHYSICA D
SOTOTREVINO C, 1996, V35, P114, J MATH BIOL
STORTI DW, 1986, V46, P56, SIAM J APPL MATH
TAYLOR D, 1998, V37, P419, J MATH BIOL
TERMAN D, 1992, V2, P133, J NONLINEAR SCI
TERMAN D, 1995, V81, P148, PHYSICA D
TERMAN D, 1991, V51, P1418, SIAM J APPL MATH
TERMAN D, 1997, V57, P252, SIAM J APPL MATH
TRAUB RD, 1991, NEURONAL NETWORKS HI
TROY WC, 1978, V36, P73, Q APPL MATH
WANG XJ, 1995, BRAIN THEORY NEURAL
WANG XJ, 1998, V79, P1549, J NEUROPHYSIOL
WANG XJ, 1993, V5, P221, NEUROREPORT
WANG XJ, 1993, V62, P263, PHYSICA D
WILLIAMS TL, 1995, BRAIN THEORY NEURAL
WILSON CJ, 1996, V16, P2397, J NEUROSCI
WILSON CJ, 1993, V99, P277, PROG BRAIN RES
WILSON HR, 1972, V12, P1, BIOPHYS J
WILSON MA, 1989, METHODS NEURONAL MOD
WU HY, 1998, V36, P569, J MATH BIOL

1/5/101 (Item 24 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

08762395 Genuine Article#: 326JM Number of References: 15
Title: Pattern recognition via synchronization in phase-locked loop neural networks
Author(s): **Hoppensteadt FC (REPRINT) ; Izhikevich EM**
Corporate Source: ARIZONA STATE UNIV,CTR SYST SCI & ENGN/TEMPE//AZ/85287 (REPRINT); INST NEUROSCI,/SAN DIEGO//CA/92121
Journal: IEEE TRANSACTIONS ON NEURAL NETWORKS, 2000, V11, N3 (MAY), P 734-738
ISSN: 1045-9227 Publication date: 20000500
Publisher: IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC, 345 E 47TH ST, NEW YORK, NY 10017-2394
Language: English Document Type: ARTICLE
Geographic Location: USA
Subfile: CC ENGI--Current Contents, Engineering, Computing & Technology;
Journal Subject Category: COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE; COMPUTER SCIENCE, HARDWARE & ARCHITECTURE; COMPUTER SCIENCE, THEORY & METHODS; ENGINEERING, ELECTRICAL & ELECTRONIC
Abstract: We propose a novel architecture of an oscillatory neural network that consists of phase-locked loop (PLL) circuits. It stores and retrieves complex oscillatory patterns as synchronized states with appropriate phase relations between neurons.
Descriptors--Author Keywords: brain rhythms ; oscillatory associative memory. ; temporal pattern recognition ; voltage-controlled oscillators (VCO's)
Identifiers--KeyWord Plus(R): SYNAPTIC ORGANIZATIONS; DYNAMICAL PROPERTIES; FM INTERACTIONS; OLFACTORY-BULB; OSCILLATORS; INFORMATION; MEMORY; MODEL; BRAIN
Cited References:
AOYAGI T, 1995, V74, P4075, PHYS REV LETT
BAIRD B, 1986, V22, P150, PHYSICA D
COHEN MA, 1983, V13, P815, IEEE T SYST MAN CYB
GRAY CM, 1994, V1, P11, J COMPUT NEUROSCI
HOPPENSTEADT FC, 1996, V75, P117, BIOL CYBERN
HOPPENSTEADT FC, 1996, V75, P129, BIOL CYBERN
HOPPENSTEADT FC, 1998, V48, P85, BIOSYSTEMS
HOPPENSTEADT FC, 1997, INTRO MATH NEURONS M
HOPPENSTEADT FC, 1989, V86, P2991, P NATL ACAD SCI USA
HOPPENSTEADT FC, 1999, V82, P2983, PHYS REV LETT
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
HOROWITZ P, 1989, ART ELECTRONICS
IZHIKEVICH EM, 1999, V10, P508, IEEE T NEURAL NETWOR
IZHIKEVICH EM, 1999, V59, P2193, SIAM J APPL MATH
LI Z, 1989, V61, P379, BIOL CYBERN

1/5/102 (Item 25 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

08716929 Genuine Article#: 320UN Number of References: 24
Title: Phase equations for relaxation oscillators
Author(s): **Izhikevich EM (REPRINT)**
Corporate Source: INST NEUROSCI,/SAN DIEGO//CA/92121 (REPRINT); ARIZONA STATE UNIV,CTR SYST SCI & ENGN/TEMPE//AZ/85287
Journal: SIAM JOURNAL ON APPLIED MATHEMATICS, 2000, V60, N5 (MAY 26), P 1789-1804
ISSN: 0036-1399 Publication date: 20000526
Publisher: SIAM PUBLICATIONS, 3600 UNIV CITY SCIENCE CENTER, PHILADELPHIA, PA 19104-2688
Language: English Document Type: ARTICLE
Geographic Location: USA
Subfile: CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS, APPLIED
Abstract: We use the Malkin theorem to derive phase equations for networks of weakly connected relaxation oscillators. We find an explicit formula for the connection functions when the oscillators have one-dimensional

slow variables. The functions are discontinuous in the relaxation limit mu --> 0, which provides a simple alternative illustration to the major conclusion of the fast threshold modulation (FTM) theory by Somers and Kopell [Biological Cybernetics, 68 (1993), pp. 393-407] that synchronization of relaxation oscillators has properties that are quite different from those of smooth (nonrelaxation) oscillators. We use Bonhoeffer-Van Der Pol relaxation oscillators to illustrate the theory numerically.

Descriptors--Author Keywords: weakly connected oscillators ; fast threshold modulation (FTM) ; synchronization ; class 2 excitability ; pulse-coupled oscillators

Identifiers--KeyWord Plus(R): NEURAL OSCILLATORS; SYNCHRONIZATION; NETWORKS

Cited References:

ARNOLD VI, 1994, V5, DYNAMICAL SYSTEMS
BELCHMAN LI, 1971, SYNCHRONIZATION DYNA
ERMENTROUT GB, 1991, V29, P195, J MATH BIOL
ERMENTROUT GB, 1996, V8, P979, NEURAL COMPUT
GRASMAN J, 1987, ASYMPTOTIC METHODS R
GRAY CM, 1994, V1, P11, J COMPUT NEUROSCI
HODGKIN AL, 1948, V107, P165, J PHYSIOL-LONDON
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
IZHIKEVICH EM, 1999, V10, P499, IEEE T NEURAL NETWOR
IZHIKEVICH EM, 1999, V10, P508, IEEE T NEURAL NETWOR
KOPELL N, 1995, BRAIN THEORY NEURAL
KOPELL N, 1995, V33, P261, J MATH BIOL
KURAMOTO Y, 1984, CHEM OSCILLATIONS WA
MALKIN IG, 1949, METHODS POINCARE LIA
MALKIN IG, 1956, SOME PROBLEMS NONLIN
MIROLLO RE, 1990, V50, P1645, SIAM J APPL MATH
PESKIN CS, 1975, MATH ASPECTS HEART P
RAND RH, 1987, P369, NEURAL CONTROL RHYTH
RINZEL J, 1989, METHODS NEURONAL MOD
SINGER W, 1995, V18, P555, ANNU REV NEUROSCI
SOMERS D, 1993, V68, P393, BIOL CYBERN
SOMERS D, 1995, V89, P169, PHYSICA D
TERMAN D, 1995, V81, P148, PHYSICA D
WINFREE AT, 1980, GEOMETRY BIOL TIME

1/5/103 (Item 26 from file: 34)

DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

08479562 Genuine Article#: 290JC Number of References: 40

Title: Subcritical elliptic bursting of Bautin type

Author(s): **Izhikevich EM (REPRINT)**
Corporate Source: ARIZONA STATE UNIV,CTR SYST SCI & ENGN/TEMPE//AZ/85287 (REPRINT)

Journal: SIAM JOURNAL ON APPLIED MATHEMATICS, 2000, V60, N2 (FEB 2), P 503-535
ISSN: 0036-1399 Publication date: 20000202
Publisher: SIAM PUBLICATIONS, 3600 UNIV CITY SCIENCE CENTER, PHILADELPHIA, PA 19104-2688
Language: English Document Type: ARTICLE
Geographic Location: USA
Subfile: CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS, APPLIED

Abstract: Bursting behavior in neurons is a recurrent transition between a quiescent state and repetitive spiking. When the transition to repetitive spiking occurs via a subcritical Andronov-Hopf bifurcation and the transition to the quiescent state occurs via double limit cycle bifurcation, the burster is said to be of subcritical elliptic type. When the fast subsystem is near a Bautin (generalized Hopf) point, both bifurcations occur for nearby values of the slow variable, and the repetitive spiking has small amplitude. We refer to such an elliptic burster as being of local Bautin type. First, we prove that any such burster can be converted into a canonical model by a suitable

continuous (possibly noninvertible) change of variables. We also derive a canonical model for weakly connected networks of such bursters. We find that behavior of such networks is quite different from the behavior of weakly connected phase oscillators, and it resembles that of strongly connected relaxation oscillators. As a result, such weakly connected bursters need few (usually one) bursts to synchronize. In-phase synchronization is possible for bursters having quite different quantitative features, whereas out-of-phase synchronization may be difficult to achieve. We also find that interactions between bursters depend crucially on the spiking frequencies. Namely, the interactions are most effective when the presynaptic interspike frequency matches the frequency of postsynaptic oscillations. Finally, we use the FitzHugh-Rinzel model to evaluate how studying local Bautin bursters can contribute to our understanding of the phenomena of subcritical elliptic bursting.

Descriptors--Author Keywords: subcritical elliptic burster ; ''sub-Hopf/fold cycle'' burster ; subcritical Andronov-Hopf bifurcation ; double limit cycle bifurcation ; Bautin bifurcation ; normal form ; canonical model ; slow passage effect ; weakly connected networks ; fast threshold modulation ; FM interactions ; FitzHugh-Rinzel model

Identifiers--KeyWord Plus(R): CONNECTED NEURAL OSCILLATORS; SINGULAR HOPF-BIFURCATION; RELAXATION OSCILLATIONS; SYNAPTIC ORGANIZATIONS; DYNAMICAL PROPERTIES; SLOW PASSAGE; NEURONS; MODEL; INVITRO

Cited References:

ARNOLD VI, 1994, V5, DYNAMICAL SYSTEMS
BAER SM, 1986, V46, P721, SIAM J APPL MATH
BAER SM, 1989, V49, P55, SIAM J APPL MATH
BAER SM, 1992, V52, P1651, SIAM J APPL MATH
BELAIR J, 1984, V42, P193, Q APPL MATH
BERTRAM R, 1995, V57, P413, B MATH BIOL
BORISYUK RM, 1992, V66, P319, BIOL CYBERN
ECKHAUS W, 1983, V985, P432, LECT NOTES MATH
ERMENTROUT GB, 1986, V78, P265, MATH BIOSCI
ERMENTROUT GB, 1986, V46, P233, SIAM J APPL MATH
FENICHEL N, 1971, V21, P193, INDIANA U MATH J
FITZHUGH R, 1961, V1, P445, BIOPHYS J
GRASMAN J, 1987, ASYMPTOTIC METHODS R
GUCKENHEIMER J, 1983, NONLINEAR OSCILLATIO
HOLDEN L, 1993, V31, P351, J MATH BIOL
HOLDEN L, 1993, V53, P1045, SIAM J APPL MATH
HOPPENSTEADT FC, 1996, V75, P117, BIOL CYBERN
HOPPENSTEADT FC, 1996, V75, P129, BIOL CYBERN
HOPPENSTEADT FC, 1998, V48, P85, BIOSYSTEMS
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
IZHIKEVICH EM, 2000, V10, IN PRESS INT J BIRUF
IZHIKEVICH EM, 1999, IN PRESS SIAM J APPL
IZHIKEVICH EM, 1998, SUPERCRITICAL ELLIPT
KOPELL N, 1995, BRAIN THEORY NEURAL
KOPELL N, 1995, V33, P261, J MATH BIOL
KUZNETSOV Y, 1995, ELEMENTS APPL BIFURC
LLINAS RR, 1988, V242, P1654, SCIENCE
MASON A, 1991, V11, P72, J NEUROSCI
MCNAUGHTON BL, 1981, V46, P952, J NEUROPHYSIOL
NEJSHTADT A, 1985, V40, P190, USP MAT NAUK
RINZEL J, 1987, V25, P653, J MATH BIOL
RINZEL J, 1987, V71, LECT NOTES BIOMATH
SAYER RJ, 1990, V10, P826, J NEUROSCI
SKINNER FK, 1994, V1, P69, J COMPUTATIONAL NEUR
SOMERS D, 1993, V68, P393, BIOL CYBERN
SOMERS D, 1995, V89, P169, PHYSICA D
STORTI DW, 1986, V46, P56, SIAM J APPL MATH
WANG XJ, 1995, BRAIN THEORY NEURAL
WILLIAMS TL, 1995, BRAIN THEORY NEURAL
WU HY, 1997, V36, P569, J MATH BIOL

1/5/104 (Item 27 from file: 34)

08173850 Genuine Article#: 254JH Number of References: 48
Title: Weakly connected quasi-periodic oscillators, FM interactions, and multiplexing in the brain
Author(s): **Izhikevich EM (REPRINT)**
Corporate Source: ARIZONA STATE UNIV,CTR SYST SCI & ENGN/TEMPE//AZ/85287 (REPRINT)
Journal: SIAM JOURNAL ON APPLIED MATHEMATICS, 1999, V59, N6 (OCT 28), P 2193-2223
ISSN: 0036-1399 Publication date: 19991028
Publisher: SIAM PUBLICATIONS, 3600 UNIV CITY SCIENCE CENTER, PHILADELPHIA, PA 19104-2688
Language: English Document Type: ARTICLE
Geographic Location: USA
Subfile: CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS, APPLIED
Abstract: We prove that weakly connected networks of quasi-periodic (multifrequency) oscillators can be transformed into a phase model by a continuous change of variables. The phase model has the same form as the one for periodic oscillators with the exception that each phase variable is a vector. When the oscillators have mutually nonresonant frequency (rotation) vectors, the phase model uncouples. This implies that such oscillators do not interact even though there might be physical connections between them. When the frequency vectors have mutual low-order resonances, the oscillators interact via phase deviations. This mechanism resembles that of the FM radio, with a shared feature-multiplexing of signals. Possible applications to neuroscience are discussed.
Descriptors--Author Keywords: weakly connected neural networks ; invariant manifolds ; quasi-periodic oscillators ; chaos ; phase model ; resonances ; FM interactions ; multiplexing ; oscillatory neurocomputer ; thalamocortical system
Identifiers--KeyWord Plus(R): COUPLED NEURAL OSCILLATORS; VISUAL-CORTEX; NEURONS; SYNCHRONIZATION; NETWORK; INVITRO; BIFURCATIONS; HIPPOCAMPUS; RESPONSES; DYNAMICS
Cited References:
ABELES M, 1994, TEMPORAL CODING BRAI
ARBIB MA, 1998, NEURAL ORG
BAESENS C, 1991, V49, P387, PHYSICA D
BAIR W, 1994, V14, P2870, J NEUROSCI
BIBIKOV NY, 1991, MULTIFREQUENCY NONLI
BORISYUK GN, 1995, V57, P809, B MATH BIOL
BROER HW, 1996, QUASIPERIODIC MOTION
BUZSAKI G, 1992, V256, P1025, SCIENCE
ERMENTROUT GB, 1981, V12, P327, J MATH BIOL
ERMENTROUT GB, 1991, V29, P195, J MATH BIOL
FENICHEL N, 1971, V21, P193, INDIANA U MATH J
FREGNAC Y, 1994, TEMPORAL CODING BRAI
GRAY CM, 1994, V1, P11, J COMPUT NEUROSCI
GRAY CM, 1989, V338, P334, NATURE
HEILIGENBERG W, 1994, TEMPORAL CODING BRAI
HIRSCH MW, 1976, DIFFERENTIAL TOPOLOG
HIRSCH MW, 1977, INVARIANT MANIFOLDS
HOPPENSTEADT FC, 1996, V75, P117, BIOL CYBERN
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
IZHIKEVICH EM, 1999, V10, P508, IEEE T NEURAL NETWOR
KAZANOVICH YB, 1994, V71, P177, BIOL CYBERN
KOPELL N, 1995, P178, HDB BRAIN THEORY NEU
KURAMOTO Y, 1984, CHEM OSCILLATIONS WA
KURAMOTO Y, 1991, V50, P15, PHYSICA D
LLINAS RR, 1991, V88, P897, P NATL ACAD SCI USA
LLINAS RR, 1988, V242, P1654, SCIENCE
MASON A, 1991, V11, P72, J NEUROSCI
MCNAUGHTON BL, 1981, V46, P952, J NEUROPHYSIOL
MILES R, 1986, V373, P397, J PHYSIOL-LONDON

MIROLLO RE, 1990, V50, P1645, SIAM J APPL MATH
NEWHOUSE S, 1978, V64, P35, COMMUN MATH PHYS
NUNEZ PL, 1995, NEOCORTICAL DYNAMICS
PESKIN CS, 1975, MATH ASPECTS HEART P
RAND RH, 1987, P369, NEURAL CONTROL RHYTH
RUELLE D, 1971, V20, P167, COMMUN MATH PHYS
SAMOILENKO AM, 1973, V71, MATH ITS APPL SOVIET
SAYER RJ, 1990, V10, P826, J NEUROSCI
SIMMONS JA, 1990, V167, P589, J COMP PHYSIOL A
SINGER W, 1995, V18, P555, ANNU REV NEUROSCI
TERMAN D, 1995, V81, P148, PHYSICA D
TOVEE MJ, 1992, V3, P369, NEUROREPORT
VONDERMALSBURG C, 1995, P329, BRAIN THEORY NEURAL
WANG DL, 1995, V6, P941, IEEE T NEURAL NETWOR
WIGGINS S, 1994, NORMALLY HYPERBOLIC
WILSON HR, 1972, V12, P1, BIOPHYS J
WILSON HR, 1973, V13, P55, KYBERNETIK
WINFREE AT, 1980, GEOMETRY BIOL TIME
YOUNG MP, 1992, V67, P1464, J NEUROPHYSIOL

1/5/105 (Item 28 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

08105686 Genuine Article#: 247EZ Number of References: 23
Title: Oscillatory models of the hippocampus: A study of spatio-temporal patterns of neural activity
Author(s): Borisyuk R (REPRINT) ; **Hoppensteadt F**
Corporate Source: UNIV PLYMOUTH,SCH COMP, CTR NEURAL & ADAPT SYST/PLYMOUTH PL4 8AA/DEVON/ENGLAND/ (REPRINT); RUSSIAN ACAD SCI,INST MATH PROBLEMS BIOL/PUSHCHINO 142292/MOSCOW REGION/RUSSIA/; ARIZONA STATE UNIV,CTR SYST SCI/TEMPE//AZ/85287
Journal: BIOLOGICAL CYBERNETICS, 1999, V81, N4 (OCT), P359-371
ISSN: 0340-1200 Publication date: 19991000
Publisher: SPRINGER VERLAG, 175 FIFTH AVE, NEW YORK, NY 10010
Language: English Document Type: ARTICLE
Geographic Location: ENGLAND; RUSSIA; USA
Subfile: CC LIFE--Current Contents, Life Sciences;
Journal Subject Category: COMPUTER SCIENCE, CYBERNETICS; NEUROSCIENCES
Abstract: Spatial patterns of theta-rhythm activity in oscillatory models of the hippocampus are studied here using canonical models for both Hodgkin's class-1 and class-2 excitable neuronal systems. Dynamics of these models are studied in both the frequency domain, to determine phase-locking patterns, and in the time domain, to determine the amplitude responses resulting from phase-locking patterns. Computer simulations presented here demonstrate that phase deviations (timings) between inputs from the medial septum and the entorhinal cortex can create spatial patterns of theta-rhythm phase-locking. In this way, we show that the timing of inputs (not only their frequencies alone) can encode specific patterns of theta-rhythm activity. This study suggests new experiments to determine temporal and spatial synchronization.
Identifiers--KeyWord Plus(R): PYRAMIDAL CELLS; THETA-RHYTHM; DYNAMICS; REGION; RAT; CA3; ORGANIZATION; INTERPLAY; AMNESIA; SYSTEM
Cited References:
AMARAL DG, 1989, V31, P571, NEUROSCIENCE
BERGER TW, 1994, V7, P1031, NEURAL NETWORKS
BIBBIG A, 1995, V66, P169, BEHAV BRAIN RES
BORISYUK GN, 1995, V57, P809, B MATH BIOL
BRAGIN A, 1995, V15, P47, J NEUROSCI
BURGESS N, 1994, V7, P1065, NEURAL NETWORKS
DUTAR P, 1995, V75, P393, PHYSIOL REV
GRAY CM, 1994, V1, P11, J COMPUT NEUROSCI
HASSELMO ME, 1995, V15, P5249, J NEUROSCI
ISHIZUKA N, 1990, V295, P580, J COMP NEUROL
MCNAUGHTON BL, 1996, V199, P173, J EXP BIOL
MCNAUGHTON BL, 1989, V17, P230, PSYCHOBIOLOGY

OKEEFE J, 1993, V3, P317, HIPPOCAMPUS
PALM G, 1993, V3, P219, HIPPOCAMPUS
SUTHERLAND RJ, 1989, V17, P129, PSYCHOBIOLOGY
TRAUB RD, 1997, V4, P141, J COMPUT NEUROSCI
TSODYKS M, 1995, V6, P81, INT J NEURAL SYS S
TSUKADA M, 1996, V9, P1357, NEURAL NETWORKS
VENTRIGLIA F, 1998, V60, P373, B MATH BIOL
VINOGRADOVA OS, 1995, V45, P523, PROG NEUROBIOL
WILSON HR, 1972, V12, P1, BIOPHYS J
WILSON MA, 1993, V261, P1055, SCIENCE
ZOLAMORGAN S, 1986, V6, P2950, J NEUROSCI

1/5/106 (Item 29 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

08085803 Genuine Article#: 244ZK Number of References: 61
Title: Computational models of predictive and memory-related functions of the hippocampus
Author(s): Borisyuk R; Denham M; Denham S; **Hoppensteadt F**
Corporate Source: UNIV PLYMOUTH,SCH COMP, CTR NEURAL & ADAPT SYST/PLYMOUTH PL4 8AA/DEVON/ENGLAND/; RUSSIAN ACAD SCI,INST MATH PROBLEMS BIOL/PUSHCHINO 142292//RUSSIA/; ARIZONA STATE UNIV,SYST SCI CTR/TEMPE//AZ/
Journal: REVIEWS IN THE NEUROSCIENCES, 1999, V10, N3-4, P213-232
ISSN: 0334-1763 Publication date: 19990000
Publisher: FREUND & PETTMAN PUBLISHERS, ENHOLMES HALL, PATRINGTON, EAST YORKSHIRE HU12 OPR, ENGLAND
Language: English Document Type: ARTICLE
Geographic Location: ENGLAND; RUSSIA; USA
Journal Subject Category: NEUROSCIENCES
Abstract: We discuss the role of the hippocampus in information processing in the brain and hypothesise that the hippocampus monitors the stability of sensory cues it receives from the external world, using the current context to predict the next sensory event in the episodic sequence by learning from experience, and memorising these sequences of sensory events. Two computational models are presented here, The predictive theory and model are closely related to experimental evidence and use dynamic synapses with an asymmetric learning rule to develop predictive neural activity of a leaky integrate-and-fire model of a pyramidal CA3 cell, The oscillatory model of the hippocampus for memorising sequences of sensory events is developed as a chain of interacting neural oscillators forced by oscillatory inputs from the entorhinal cortex and from the medial septum.
Descriptors--Author Keywords: computational models ; hippocampus ; memory ; predictive learning ; oscillatory neural networks
Identifiers--KeyWord Plus(R): LONG-TERM POTENTIATION; NEOCORTICAL PYRAMIDAL NEURONS; SYNAPTIC PLASTICITY; DENDRITIC SPINES; PLACE CELLS; RAT; BRAIN; CA3; AMPLIFICATION; INDUCTION
Cited References:
AMARAL DG, 1989, V31, P571, NEUROSCIENCE
AMIT D, 1989, PCH5, MODELLING BRAIN FUNC
BADDELEY AD, 1974, V8, PSYCHOL LEARNING MOT
BARLOW H, 1990, V30, P1561, VISION RES
BERZHANSKAYA J, 1998, V79, P2111, J NEUROPHYSIOL
BI GQ, 1998, V18, P10464, J NEUROSCI
BLUM KI, 1996, V8, P85, NEURAL COMPUT
BORISYUK G, 1999, IN PRESS OSCILLATION
BORISYUK GN, 1995, V57, P809, B MATH BIOL
BORISYUK R, 1998, V48, P3, BIOSYSTEMS
BORISYUK R, 1999, IN PRESS BIOL CYBERN
BORISYUK RM, 1992, V66, P319, BIOL CYBERN
BRAGIN A, 1995, V15, P47, J NEUROSCI
COLE AE, 1984, V305, P283, BRAIN RES
DAMASIO AR, 1989, V1, P123, NEURAL COMPUTATION
DEBANNE D, 1995, V73, P1295, CAN J PHYSIOL PHARM

DEBANNE D, 1998, V507, P237, J PHYSIOL-LONDON
DENHAM MJ, 1998, CNAS9801 U PLYM SCH
DENHAM MJ, 1998, P1547, P I EL EL ENG INT JO
DENHAM MJ, 1996, P1283, P WORLD C NEUR NETW
EICHENBAUM H, 1997, V277, P330, SCIENCE
FUSTER JM, 1989, PREFRONTAL CORTEX
GRAY JA, 1995, V18, P659, BEHAV BRAIN SCI
GROSSBERG S, 1995, V83, P438, AM SCI
GROSSBERG S, 1975, V18, P263, INT REV NEUROBIOL
GROSSBERG S, 1969, V22, P325, J THEOR BIOL
GROSSBERG S, 1998, V21, P1, JNNS NEWSLETTER
GROSSBERG S, 1989, V2, P79, NEURAL NETWORKS
GROSSBERG S, 1998, P11, NEURAL NETWORKS
GROSSBERG S, 1968, V60, P758, P NATL ACAD SCI USA
GROSSBERG S, 1982, STUDIES MIND BRAIN N
HASSELMO ME, 1995, V67, P1, BEHAV BRAIN RES
HOPPENSTEADT FC, 1999, IN PRESS RANDOMLY PE
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
JAFFE D, 1990, V64, P948, J NEUROPHYSIOL
KRYUKOV VI, 1990, P225, STOCHASTIC CELLULAR
LEVY WB, 1983, V8, P791, NEUROSCIENCE
MACGREGOR RJ, 1989, NEURAL BRAIN MODELLI
MAGEE JC, 1997, V275, P209, SCIENCE
MARKRAM H, 1996, V382, P807, NATURE
MARKRAM H, 1997, V275, P213, SCIENCE
MARR D, 1971, V262, P23, PHILOS T ROY SOC B
MCNAUGHTON BL, 1996, V199, P173, J EXP BIOL
MEHTA MR, 1997, V94, P8918, P NATL ACAD SCI USA
MILLER JP, 1985, V325, P325, BRAIN RES
MULLER RU, 1989, V9, P4101, J NEUROSCI
MURRAY EA, 1998, V18, P6568, J NEUROSCI
OKEEFE J, 1978, HIPPOCAMPUS COGNITIV
PRIBRAM KH, 1992, V658, P65, ANN NY ACAD SCI
SHEPHERD GM, 1985, V82, P2192, P NATL ACAD SCI USA
SINGER W, 1994, LARGE SCALE NEURONAL
SQUIRE LR, 1992, V99, P195, PSYCHOL REV
TRAUB RD, 1997, V4, P141, J COMPUT NEUROSCI
TSODYKS MV, 1997, V94, P719, P NATL ACAD SCI USA
URBAN NN, 1998, V80, P1558, J NEUROPHYSIOL
URBAN NN, 1996, V16, P4293, J NEUROSCI
VINOGRADOVA OS, 1995, V45, P523, PROG NEUROBIOL
WHITTINGTON MA, 1997, V502, P591, J PHYSIOL-LONDON
WILSON HR, 1972, V12, P1, BIOPHYS J
ZALUTSKY RA, 1990, V248, P1619, SCIENCE
ZHANG KC, 1998, V79, P1017, J NEUROPHYSIOL

1/5/107 (Item 30 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

07661561 Genuine Article#: 193EJ Number of References: 33
Title: Weakly pulse-coupled oscillators, FM interactions, synchronization, and oscillatory associative memory
Author(s): **Izhikevich EM (REPRINT)**
Corporate Source: ARIZONA STATE UNIV,CTR SYST SCI & ENGN/TEMPE//AZ/85287 (REPRINT)
Journal: IEEE TRANSACTIONS ON NEURAL NETWORKS, 1999, V10, N3 (MAY), P 508-526
ISSN: 1045-9227 Publication date: 19990500
Publisher: IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC, 345 E 47TH ST, NEW YORK, NY 10017-2394
Language: English Document Type: ARTICLE
Geographic Location: USA
Subfile: CC ENGI--Current Contents, Engineering, Computing & Technology
Journal Subject Category: COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE; COMPUTER SCIENCE, HARDWARE & ARCHITECTURE; COMPUTER SCIENCE, THEORY &

METHODS; ENGINEERING, ELECTRICAL & ELECTRONIC

Abstract: We study pulse-coupled neural networks that satisfy only two assumptions: each isolated neuron fires periodically, and. the neurons are weakly connected. Each such network can be transformed by a piece-mise continuous change of variables into a phase model, whose synchronization behavior and oscillatory associative properties are easier to analyze and understand. Using the phase model, we can predict whether a given pulse-coupled network has oscillatory associative memory, or what minimal adjustments should be made so that it can acquire memory. In the search for such minimal adjustments we obtain a large class of simple pulse-coupled neural networks that can memorize and reproduce synchronized temporal patterns the same way a Hopfield network does with static patterns. The learning occurs via modification of synaptic weights and/or synaptic transmission delays.

Descriptors--Author Keywords: canonical models ; Class 1 neural excitability ; integrate-and-fire neurons ; multiplexing ; syn-fire chain ; transmission delay

Identifiers--KeyWord Plus(R): CONNECTED NEURAL OSCILLATORS; SYNAPTIC ORGANIZATIONS; DYNAMICAL PROPERTIES; NETWORK MODELS; FIRE NEURONS; MODULATION; INVITRO

Cited References:
ABELES M, 1991, CORTICONICS NEURAL C
ABOTT LF, V48, P1483, PHYS REV E
COOMBES S, 1997, V56, P5809, PHYS REV E
ERMENTROUT GB, 1996, V8, P979, NEURAL COMPUT
ERMENTROUT GB, 1994, P79, NEURAL MODELING NEUR
ERMENTROUT GB, 1986, V46, P233, SIAM J APPL MATH
ERMENTROUT GB, 1992, V52, P1665, SIAM J APPL MATH
ERNST U, 1995, V74, P1570, PHYS REV LETT
GERSTNER W, 1995, V51, P738, PHYS REV E
HANSEL D, 1995, V7, P307, NEURAL COMPUT
HODGKIN AL, 1948, V107, P165, J PHYSIOL-LONDON
HOPFIELD JJ, 1995, V92, P6655, P NATL ACAD SCI USA
HOPPENSTEADT FC, 1996, V75, P117, BIOL CYBERN
HOPPENSTEADT FC, 1996, V75, P129, BIOL CYBERN
HOPPENSTEADT FC, 1998, IN PRESS BIOSYSTEMS
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
IZHIKEVICH EM, 1998, IN PRESS SIAM J APPL
IZHIKEVICH EM, UNPUB PHYS REV E
KURAMOTO Y, 1984, CHEM OSCILLATIONS WA
KURAMOTO Y, 1991, V50, P15, PHYSICA D
LINDBLAD T, 1997, IMAGE PROCESSING USI
MAASS W, 1997, V10, P1659, NEURAL NETWORKS
MASON A, 1991, V11, P72, J NEUROSCI
MATHAR R, 1996, V56, P1094, SIAM J APPL MATH
MCNAUGHTON BL, 1981, V46, P952, J NEUROPHYSIOL
MILES R, 1986, V373, P397, J PHYSIOL-LONDON
MIROLLO RE, 1990, V50, P1645, SIAM J APPL MATH
NISHURA Y, 1995, DYNAMICAL SYSTEMS AP
PESKIN CS, 1975, MATH ASPECTS HEART P
SAYER RJ, 1990, V10, P826, J NEUROSCI
SOMERS D, 1993, V68, P393, BIOL CYBERN
TSODYKS M, 1993, V71, P1280, PHYS REV LETT
VREESWIJK CV, 1994, V1, P313, J COMPUT NEUROSCI

1/5/108 (Item 31 from file: 34)

DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

07661560 Genuine Article#: 193EJ Number of References: 11

Title: Class 1 neural excitability, conventional synapses, weakly connected networks, and mathematical foundations of pulse-coupled models

Author(s): **Izhikevich EM (REPRINT)**

Corporate Source: ARIZONA STATE UNIV,CTR SYST SCI & ENGN/TEMPE//AZ/85287 (REPRINT)

Journal: IEEE TRANSACTIONS ON NEURAL NETWORKS, 1999, V10, N3 (MAY), P

499-507
ISSN: 1045-9227 Publication date: 19990500
Publisher: IEEE-INST ELECTRICAL ELECTRONICS ENGINEERS INC, 345 E 47TH ST, NEW YORK, NY 10017-2394
Language: English Document Type: ARTICLE
Geographic Location: USA
Subfile: CC ENGI--Current Contents, Engineering, Computing & Technology
Journal Subject Category: COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE; COMPUTER SCIENCE, HARDWARE & ARCHITECTURE; COMPUTER SCIENCE, THEORY & METHODS; ENGINEERING, ELECTRICAL & ELECTRONIC
Abstract: Many scientists believe that all pulse-coupled neural networks are toy models that are far away from the biological reality, We show here, however, that a huge class of biophysically detailed and biologically plausible neural-network models can be transformed into a canonical pulse-coupled form by a piece-wise continuous, possibly noninvertible, change of variables, Such transformations exist when a network satisfies a number of conditions; e.g., it is weakly connected; the neurons are Class 1 excitable (i.e., they can generate action potentials with an arbitrary small frequency); and the synapses between neurons are conventional (i.e., axo-dendritic and axe-somatic). Thus, the difference between studying the pulse-coupled model and Hodgkin-Huxley-type neural networks is just a matter of a coordinate change. Therefore, any piece of information about the pulse-coupled model is valuable since it tells something about all weakly connected networks of Class 1 neurons. For example, we show that the pulse-coupled network of identical neurons does not synchronize in-phase. This confirms Ermentrout's result that weakly connected Class 1 neurons are difficult to synchronize, regardless of the equations that describe dynamics of each cell.
Descriptors--Author Keywords: canonical model ; class 1 neural excitability ; conventional synapses ; desynchronization ; integrate-and-fire ; saddle-node on limit cycle bifurcation ; weakly connected neural networks
Cited References:
CONNOR JA, 1977, V18, P81, BIOPHYS J
ERMENTROUT GB, 1996, V8, P979, NEURAL COMPUT
ERMENTROUT GB, 1986, V46, P233, SIAM J APPL MATH
HANSEL D, 1995, V7, P307, NEURAL COMPUT
HODGKIN AL, 1948, V107, P165, J PHYSIOL-LONDON
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
MCNAUGHTON BL, 1981, V46, P952, J NEUROPHYSIOL
MORRIS C, 1981, V35, P193, BIOPHYS J
RINZEL J, 1989, METHODS NEURONAL MOD
RUSH ME, 1995, V57, P899, B MATH BIOL
SHEPHERD GM, 1983, NEUROBIOL

1/5/109 (Item 32 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

07570622 Genuine Article#: 182GL Number of References: 16
Title: Oscillatory neurocomputers with dynamic connectivity
Author(s): **Hoppensteadt FC ; Izhikevich EM (REPRINT)**
Corporate Source: ARIZONA STATE UNIV,CTR SYST SCI & ENGN/TEMPE//AZ/85287 (REPRINT); ARIZONA STATE UNIV,CTR SYST SCI & ENGN/TEMPE//AZ/85287
Journal: PHYSICAL REVIEW LETTERS, 1999, V82, N14 (APR 5), P2983-2986
ISSN: 0031-9007 Publication date: 19990405
Publisher: AMERICAN PHYSICAL SOC, ONE PHYSICS ELLIPSE, COLLEGE PK, MD 20740-3844
Language: English Document Type: ARTICLE
Geographic Location: USA
Subfile: CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: PHYSICS
Abstract: Our study of thalamo-cortical systems suggests a new architecture for a neurocomputer that consists of oscillators having different frequencies and that are connected weakly via a common medium forced by

an external input. Even though such oscillators are all interconnected homogeneously, the external input imposes a dynamic connectivity. We use Kuramoto's model to illustrate the idea and to prove that such a neurocomputer has oscillatory associative properties. Then we discuss a general case. The advantage of such a neurocomputer is that it can be built using voltage controlled oscillators, optical oscillators, lasers, microelectromechanical systems, Josephson junctions, macromolecules, or oscillators of other kinds. (Provisional patent 60/108,353) [S0031-9007(99)08813-4].

Identifiers--KeyWord Plus(R): NEURAL OSCILLATORS; OLFACTORY-BULB; NETWORK

Cited References:

ABBOTT LF, 1990, V23, P3835, J PHYS A-MATH GEN
ARBIB MA, 1995, BRAIN THEORY NEURAL
BAIRD B, 1986, V22, P150, PHYSICA D
CHAKRAVARTHY SV, 1996, V75, P229, BIOL CYBERN
GROSSBERG S, 1988, V1, P17, NEURAL NETWORKS
HEILIGENBERG W, 1994, TEMPORAL CODING BRAI
HOPPENSTEADT FC, 1996, V75, P129, BIOL CYBERN
HOPPENSTEADT FC, 1998, V48, P85, BIOSYSTEMS
HOPPENSTEADT FC, 1997, V6, CAMBRIDGE STUDIES MA
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
IZHIKEVICH EM, IN PRESS OSCILLATORY
IZHIKEVICH EM, IN PRESS SIAM J APPL
KURAMOTO Y, 1984, CHEM OSCILLATIONS WA
LI Z, 1989, V61, P379, BIOL CYBERN
NGUYEN CTC, 1998, V1, P445, P IEEE AER C SNOWM C
TERMAN D, 1995, V81, P148, PHYSICA D

1/5/110 (Item 33 from file: 34)

DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

07336074 Genuine Article#: 152CH Number of References: 20

Title: Thalamo-cortical interactions modeled by weakly connected oscillators: could the brain use FM radio principles?

Author(s): **Hoppensteadt FC ; Izhikevich EM (REPRINT)**
Corporate Source: ARIZONA STATE UNIV,CTR SYST SCI & ENGN/TEMPE//AZ/85287 (REPRINT); ARIZONA STATE UNIV,CTR SYST SCI & ENGN/TEMPE//AZ/85287

Journal: BIOSYSTEMS, 1998, V48, N1-3 (SEP-DEC), P85-94
ISSN: 0303-2647 Publication date: 19980900
Publisher: ELSEVIER SCI IRELAND LTD, CUSTOMER RELATIONS MANAGER, BAY 15, SHANNON INDUSTRIAL ESTATE CO, CLARE, IRELAND
Language: English Document Type: ARTICLE
Geographic Location: USA
Subfile: CC LIFE--Current Contents, Life Sciences;
Journal Subject Category: BIOLOGY

Abstract: We consider all models of the thalamo-cortical system that satisfy the following two assumptions: (I) each cortical column is an autonomous oscillator; (2) connections between cortical columns and the thalamus are weak. Our goal is to deduce from these assumptions general principles of thalamo-cortical interactions that are independent of the equations describing the system. We find that the existence of synaptic connections between any two cortical columns does not guaranfee that the columns interact: They interact only when there is a certain nearly resonant relation between their frequencies, which implies that the interactions are frequency modulated (FM). When the resonance relation holds, the cortical columns interact through phase modulations. Thus, communications between weakly connected cortical oscillators employ a principle similar to that in FM radio: The frequency of oscillation encodes the channel of communication, while the information is transmitted via phase modulations. If the thalamic input has an appropriate frequency, then it can dynamically link any two cortical columns, even those that have non-resonant frequencies and would otherwise be unlinked. Thus, by adjusting its temporal activity, the thalamus has control over information processing taking place in the cortex. Our results suggest that the mean firing rate (frequency) of

periodically spiking neuron does not carry any information other than identifying a channel of communication. Information (i.e. neural code) is carried through modulations of interspike intervals.

Descriptors--Author Keywords: quasiperiodic oscillators ; canonical model ; FM interactions ; neural code ; Hodgkin-Huxley ; Wilson-Cowan

Identifiers--KeyWord Plus(R): NEURAL OSCILLATORS

Cited References:

ABELES M, 1991, CORTICONICS NEURAL C
ABELES M, 1982, V18, P83, ISRAEL J MED SCI
ABELES M, 1994, TEMPORAL CODING BRAI
AERTSEN AMH, 1991, NEURONAL COOPERATIVI
BLECHMAN II, 1971, SINCHRONIZATZIA DINA
ERMENTROUT GB, 1981, V12, P327, J MATH BIOL
ERMENTROUT GB, 1991, V29, P195, J MATH BIOL
FREGNAC Y, 1994, TEMPORAL CODING BRAI
FUJII H, 1996, V9, P1303, NEURAL NETWORKS
HODGKIN AL, 1952, V117, P500, J PHYSIOL
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
IZHIKEVICH EM, 1998, IN PRESS SIAM J APPL
KURAMOTO Y, 1984, CHEM OSCILLATIONS WA
MALKIN IG, 1949, METODI PUANKARE LIAP
MALKIN IG, 1956, NEKOTORYE ZADACHI TE
MCNAUGHTON BL, 1981, V46, P952, J NEUROPHYSIOL
NEU JC, 1979, V37, P307, SIAM J APPL MATH
TERMAN D, 1995, V81, P148, PHYSICA D
VONDERMALSBURG C, 1995, BRAIN THEORY NEURAL
WILSON HR, 1973, V13, P55, KYBERNETIK

1/5/111 (Item 34 from file: 34)

07336065 Genuine Article#: 152CH Number of References: 18

Title: Memorizing and recalling spatial-temporal patterns in an oscillator model of the hippocampus

Author(s): Borisyuk RM (REPRINT) ; **Hoppensteadt FC**
Corporate Source: UNIV PLYMOUTH,SCH COMP, DRAKE CIRCUS/PLYMOUTH PL4 8AA/DEVON/ENGLAND/ (REPRINT); ARIZONA STATE UNIV,SYST SCI & ENGN RES CTR/TEMPE//AZ/85287; RUSSIAN ACAD SCI,INST MATH PROBLEMS BIOL/MOSCOW 117901//RUSSIA/

Journal: BIOSYSTEMS, 1998, V48, N1-3 (SEP-DEC), P3-10
ISSN: 0303-2647 Publication date: 19980900
Publisher: ELSEVIER SCI IRELAND LTD, CUSTOMER RELATIONS MANAGER, BAY 15, SHANNON INDUSTRIAL ESTATE CO, CLARE, IRELAND
Language: English Document Type: ARTICLE
Geographic Location: ENGLAND; USA; RUSSIA
Subfile: CC LIFE--Current Contents, Life Sciences;
Journal Subject Category: BIOLOGY

Abstract: We describe the model of the hippocampus consisting of interactive oscillators with input from the entorhinal cortex (modulating the main information dow by a theta rhythm) and the septum (a theta rhythm generator). When interconnections between oscillators are allowed to strengthen in an adaptive way, the network can be trained using a series of lessons. This results in a connection matrix that memorizes the temporal sequence of inputs. Presenting one of the lessons to the trained network results in reproduction of the remainder of the sequence. In this paper, we create such a connection matrix, derive from it an appropriate Markov chain and simulate the chain to illustrate its dynamics.

Descriptors--Author Keywords: phase locked theta rhythms ; phase modulation ; Markov chain ; memory

Identifiers--KeyWord Plus(R): THETA-RHYTHM

Cited References:

AMARAL DG, 1989, V31, P571, NEUROSCIENCE

AMIT DJ, 1989, PCH5, MODELLING BRAIN FUNC
ANDERSON JA, 1988, NEUROCOMPUTING
BORISYUK RM, 1998, UNPUB BIOL CYBERN
BRAGIN A, 1995, V15, P47, J NEUROSCI
BUZSAKI G, 1994, TEMPORAL CODING BRAI
CHETAEV AN, 1984, NEURAL NETS MARKOV
HOPPENSTEADT FC, 1998, IN PRESS RANDOMLY PE
HOPPENSTEADT FC, 1997, INTRO MATH NEURONS
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
IIJIMA T, 1996, V272, P1176, SCIENCE
ISAACSON RL, 1982, LIMBIC SYSTEM
MCNAUGHTON BL, 1996, V199, P173, J EXP BIOL
NADAS A, 1996, P603, MATH PERSPECTIVES NE
OKEEFE J, 1993, V3, P317, HIPPOCAMPUS
OKEEFE J, 1978, HIPPOCAMPUS COGNITIV
TRAUB R, 1991, NEURAL NETWORKS HIPP
VINOGRADOVA OS, 1995, V45, P523, PROG NEUROBIOL

1/5/112 (Item 35 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

06910551 Genuine Article#: 101XL Number of References: 17
Title: Phase models with explicit time delays
Author(s): **Izhikevich EM (REPRINT)**
Corporate Source: ARIZONA STATE UNIV,CTR SYST SCI & ENGN/TEMPE//AZ/85287
(REPRINT)
Journal: PHYSICAL REVIEW E, 1998, V58, N1 (JUL), P905-908
ISSN: 1063-651X Publication date: 19980700
Publisher: AMERICAN PHYSICAL SOC, ONE PHYSICS ELLIPSE, COLLEGE PK, MD
20740-3844
Language: English Document Type: ARTICLE
Geographic Location: USA
Subfile: CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: PHYSICS, MATHEMATICAL; PHYSICS, FLUIDS & PLASMAS
Abstract: Studying weakly connected oscillators leads to phase models. It has been proven recently that weakly connected oscillators with delayed interactions do not lead to phase models with time delays even when the delay is of the same order of magnitude as the period of oscillation. This has resulted in a fading interest in such models. We prove here that if the interaction delay between weakly connected oscillators is much longer than the period of oscillation, then the corresponding phase model does have an explicit time delay.
Identifiers--KeyWord Plus(R): OSCILLATORS
Cited References:
BLECHMAN II, 1971, SYNCRHONIZATION DYAN
BUCK J, 1976, V234, P74, SCI AM
ERMENTROUT GB, 1981, V12, P327, J MATH BIOL
ERMENTROUT GB, 1991, V29, P195, J MATH BIOL
ERMENTROUT GB, 1994, P79, NEURAL MODELING NEUR
FENICHEL N, 1971, V21, P193, INDIANA U MATH J
GRAY CM, 1994, V1, P11, J COMPUT NEUROSCI
HIRSCH MW, 1977, INVARIANT MANIFOLDS
HOPPENSTEADT F, 1997, WEAKLY CONNECTED NEU
KIM S, 1997, V79, P2911, PHYS REV LETT
KURAMOTO Y, 1984, CHEM OSCILLATIONS WA
LUZYANINA TB, 1995, V6, P43, NETWORK-COMP NEURAL
MALKIN IG, 1949, METHODS POINCARE LIA
MALKIN IG, 1956, SOME PROBLEMS NONLIN
NIEBUR E, 1991, V67, P2753, PHYS REV LETT
PESKIN CS, 1975, MATH ASPECTS HEART P
SHEPHERD GM, 1983, NEUROBIOLOGY

1/5/113 (Item 36 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

06881363 Genuine Article#: ZZ053 Number of References: 30
Title: Multiple cusp bifurcations
Author(s): **Izhikevich EM (REPRINT)**
Corporate Source: ARIZONA STATE UNIV,CTR SYST SCI & ENGN/TEMPE//AZ/85287 (REPRINT); MICHIGAN STATE UNIV,DEPT MATH/E LANSING//MI/48824
Journal: NEURAL NETWORKS, 1998, V11, N3 (APR), P495-508
ISSN: 0893-6080 Publication date: 19980400
Publisher: PERGAMON-ELSEVIER SCIENCE LTD, THE BOULEVARD, LANGFORD LANE, KIDLINGTON, OXFORD OX5 1GB, ENGLAND
Language: English Document Type: ARTICLE
Geographic Location: USA
Subfile: CC ENGI--Current Contents, Engineering, Computing & Technology
Journal Subject Category: COMPUTER SCIENCE, ARTIFICIAL INTELLIGENCE
Abstract: The cusp bifurcation provides one of the simplest routes leading to bistability and hysteresis in neuron dynamics. We show that weakly connected networks of neurons near cusp bifurcations that satisfy a certain adaptation condition have quite interesting and complicated dynamics. First, we prove that any such network can be transformed into a canonical model by an appropriate continuous change of variables. Then we show that the canonical model can operate as a multiple attractor neural network or as a globally asymptotically stable neural network depending on the choice of parameters. (C) 1998 Elsevier Science Ltd. All rights reserved.
Descriptors--Author Keywords: weakly connected neural networks ; multiple cusp bifurcations ; multiple pitchfork bifurcations ; canonical models ; Hebbian learning ; bistability of perception
Identifiers--KeyWord Plus(R): CONNECTED NEURAL OSCILLATORS; OLFACTORY-BULB; SYNAPTIC ORGANIZATIONS; DYNAMICAL PROPERTIES; PATTERN-FORMATION; NETWORKS; MODEL; PERCEPTION; NEURONS; INVITRO
Cited References:
ATTNEAVE F, 1971, V225, P63, SCI AM
BAIRD B, 1986, V22, P150, PHYSICA D
BORISYUK RM, 1992, V66, P319, BIOL CYBERN
COHEN MA, 1983, V13, P815, IEEE T SYST MAN CYB
DITZINGER T, 1989, V61, P279, BIOL CYBERN
ELBERT T, 1994, V74, P1, PHYSIOL REV
ERDI P, 1993, V69, P57, BIOL CYBERN
ERMENTROUT GB, 1994, P79, NEURAL MODELING NEUR
FISHER GH, 1967, V80, P541, AM J PSYCHOL
GROSSBERG S, 1988, V1, P17, NEURAL NETWORKS
HEBB DO, 1949, ORG BEHAVIOR
HIRSCH MW, 1989, V2, P331, NEURAL NETWORKS
HOPFIELD JJ, 1982, V79, P2554, P NATL ACAD SCI USA
HOPPENSTEADT FC, 1996, V75, P117, BIOL CYBERN
HOPPENSTEADT FC, 1996, V75, P129, BIOL CYBERN
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
IZHIKEVICH EM, 1996, THESIS MICHIGAN STAT
IZHIKEVICH EM, 1993, 17 I APPL MATH RUSS
KOPELL N, 1995, BRAIN THEORY NEURAL
KOWALSKI JM, 1992, V5, P805, NEURAL NETWORKS
KUZNETSOV Y, 1995, ELEMENTS APPL BIFURC
LI Z, 1989, V61, P379, BIOL CYBERN
MASON A, 1991, V11, P72, J NEUROSCI
MCNAUGHTON BL, 1981, V46, P952, J NEUROPHYSIOL
POSTON T, 1978, V23, P318, BEHAV SCI
RAPAPORT A, 1952, V14, P35, B MATH BIPHYSICS
SAYER RJ, 1990, V10, P826, J NEUROSCI
SKARDA CA, 1987, V10, P161, BEHAV BRAIN SCI
SMALE S, 1974, V6, P15, AM MATH SOC LECTURES
STEWART IN, 1983, V94, P336, PSYCHOL BULL

1/5/114 (Item 37 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

06101808   Genuine Article#: XV187   Number of References: 15
Title: Wave propagation in mathematical models of striated cortex
Author(s): **Hoppensteadt FC (REPRINT)** ; Mittelmann HD
Corporate Source: ARIZONA STATE UNIV,DEPT MATH, SYST SCI & ENGN RES CTR/TEMPE//AZ/85287 (REPRINT); ARIZONA STATE UNIV,DEPT ELECT ENGN/TEMPE//AZ/85287
Journal: JOURNAL OF MATHEMATICAL BIOLOGY, 1997, V35, N8 (SEP), P988-994
ISSN: 0303-6812   Publication date: 19970900
Publisher: SPRINGER VERLAG, 175 FIFTH AVE, NEW YORK, NY 10010
Language: English   Document Type: ARTICLE
Geographic Location: USA
Subfile: CC LIFE--Current Contents, Life Sciences
Journal Subject Category: BIOLOGY, MISCELLANEOUS; MATHEMATICS, MISCELLANEOUS
Cited References:
GORMAN ALF, 1970, V210, P897, J PHYSIOL-LONDON
HOPPENSTEADT FC, 1986, INTRO MATH NEURONS
HOPPENSTEADT FC, 1997, INTRO MATH NEURONS
HOPPENSTEADT FC, 1996, V75, P117, LEARNING PHASE INFOR
HOPPENSTEADT FC, 1996, P 3 EC MATH BIOL MED
HOPPENSTEADT FC, 1997, WEAKLY CONNECTED NEU
IZHIKEVICH E, 1996, THESIS MICH ST U
KRYUKOV VI, 1990, STOCHASTIC CELLULAR
KUZNETZOV YA, 1995, ELEMENTS APPL BIFURC
MIURA RM, 1978, V23, P257, BIOPHY J
PRICE PJ, 1981, V7, P67, J COMPUT APPL MATH
SINGER W, 1988, LARGESCALE NEURONAL
SKAGGS WE, 1996, V271, P1870, SCIENCE
TUCKWELL HC, 1988, INTRO THEORETICAL NE
WILSON HR, 1973, V13, P55, KYBERNETIK

1/5/115   (Item 38 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

05212897   Genuine Article#: VH418   Number of References: 8
Title: SYNAPTIC ORGANIZATIONS AND DYNAMICAL PROPERTIES OF WEAKLY CONNECTED NEURAL OSCILLATORS .2. LEARNING PHASE INFORMATION
Author(s): **HOPPENSTEADT FC ; IZHIKEVICH EM**
Corporate Source: ARIZONA STATE UNIV,SYST SCI CTR,BOX 7606/TEMPE//AZ/85287; ARIZONA STATE UNIV,SYST SCI CTR/TEMPE//AZ/85287
Journal: BIOLOGICAL CYBERNETICS, 1996, V75, N2 (AUG), P129-135
ISSN: 0340-1200
Language: ENGLISH   Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC LIFE--Current Contents, Life Sciences
Journal Subject Category: COMPUTER SCIENCE, CYBERNETICS; BIOLOGY, MISCELLANEOUS
Abstract: This is the second of two articles devoted to analyzing the relationship between synaptic organizations (anatomy) and dynamical properties (function) of networks of neural oscillators near multiple supercritical Andronov-Hopf bifurcation points. Here we analyze learning processes in such networks. Regarding learning dynamics, we assume (1) learning is local (i.e. synaptic modification depends on pre- and postsynaptic neurons but not on others), (2) synapses modify slowly relative to characteristic neuron response times, (3) in the absence of either pre- or postsynaptic activity, the synapse weakens (forgets). Our major goal is to analyze all synaptic organizations of oscillatory neural networks that can memorize and retrieve phase information or time delays. We show that such networks have the following attributes: (1) the rate of synaptic plasticity connected with learning is determined locally by the presynaptic neurons, (2) the excitatory neurons must be long-axon relay neurons capable of forming distant connections with other excitatory and inhibitory neurons, (3) if inhibitory neurons have long axons, then the network can learn,

passively forget and actively unlearn information by adjusting synaptic plasticity rates.
Identifiers--KeyWords Plus: OLFACTORY-BULB; NETWORKS
Research Fronts; 94-0812 001 (NEURAL NETWORKS; HOPFIELD ASSOCIATIVE MEMORY; EXACTLY SOLVABLE MODEL OF UNSUPERVISED LEARNING)
Cited References:

BAIRD B, 1986, V22, P150, PHYSICA D
GROSSBERG S, 1988, V1, P17, NEURAL NETWORKS
HEBB DO, 1949, ORG BEHAVIOR
HOPFIELD JJ, 1982, V79, P2554, P NATL ACAD SCI USA
HOPPENSTEADT FC, 1996, V75, P117, BIOL CYBERN
LI Z, 1989, V61, P379, BIOL CYBERN
RAKIC P, 1976, LOCAL CIRCUIT NEURON
SHEPHERD GM, 1983, NEUROBIOLOGY

1/5/116 (Item 39 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

05212896 Genuine Article#: VH418 Number of References: 32
Title: SYNAPTIC ORGANIZATIONS AND DYNAMICAL PROPERTIES OF WEAKLY CONNECTED NEURAL OSCILLATORS .1. ANALYSIS OF A CANONICAL MODEL
Author(s): **HOPPENSTEADT FC ; IZHIKEVICH EM**
Corporate Source: ARIZONA STATE UNIV,SYST SCI CTR,BOX 7606/TEMPE//AZ/85287; ARIZONA STATE UNIV,SYST SCI CTR/TEMPE//AZ/85287
Journal: BIOLOGICAL CYBERNETICS, 1996, V75, N2 (AUG), P117-127
ISSN: 0340-1200
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC LIFE--Current Contents, Life Sciences
Journal Subject Category: COMPUTER SCIENCE, CYBERNETICS; BIOLOGY, MISCELLANEOUS
Abstract: We study weakly connected networks of neural oscillators near multiple Andronov-Hopf bifurcation points. We analyze relationships between synaptic organizations (anatomy) of the networks and their dynamical properties (function). Our principal assumptions are: (1) Each neural oscillator comprises two populations of neurons: excitatory and inhibitory ones; (2) activity of each population of neurons is described by a scalar (one-dimensional) variable; (3) each neural oscillator is near a nondegenerate supercritical Andronov-Hopf bifurcation point; (4) the synaptic connections between the neural oscillators are weak.

All neural networks satisfying these hypotheses are governed by the same dynamical system, which we call the canonical model. Studying the canonical model shows that: (1) A neural oscillator can communicate only with those oscillators which have roughly the same natural frequency. That is, synaptic connections between a pair of oscillators having different natural frequencies are functionally insignificant. (2) Two neural oscillators having the same natural frequencies might not communicate if the connections between them are from among a class of pathological synaptic configurations. In both cases the anatomical presence of synaptic connections between neural oscillators does not necessarily guarantee that the connections are functionally significant. (3) There can be substantial phase differences (time delays) between the neural oscillators, which result from the synaptic organization of the network, not from the transmission delays. Using the canonical model we can illustrate self-ignition and autonomous quiescence (oscillator death) phenomena. That is, a network of passive elements can exhibit active properties and vice versa. We also study how Dale's principle affects dynamics of the networks, in particular, the phase differences that the network can reproduce. We present a complete classification of all possible synaptic organizations from this point of view. The theory developed here casts some light on relations between synaptic organization acid functional properties of oscillatory networks, The major advantage of our approach is that we

obtain results about all networks of neural oscillators, including the real brain. The major drawback is that our findings are valid only when the brain operates near a critical regime, viz. for a multiple Andronov-Hopf bifurcation.

Identifiers--KeyWords Plus: COUPLED CHEMICAL OSCILLATORS; OLFACTORY-BULB; VISUAL-CORTEX; SYNCHRONIZATION; NETWORKS; CHAOS; CAT

Research Fronts: 94-5100 002 (STOCHASTIC NEURAL NETWORKS; SYNCHRONIZATION DYNAMICS; MODEL FOR A NEURONAL ASSEMBLY; TEMPORAL INFORMATION; BRAIN WAVES; ANGULAR INDUCTION; BURSTING CELLS)

94-1514 001 (CHAOS IN RANDOM NEURAL NETWORKS; NONLINEAR MODELS OF ELECTROENCEPHALOGRAPHIC DYNAMICS; INFORMATION TRANSPORT)

Cited References:

ARONSON DG, 1990, V41, P403, PHYSICA D
BAIRD B, 1986, V22, P150, PHYSICA D
BARELI K, 1985, V14, P242, PHYSICA D
DALE HH, 1935, V28, P319, P ROY SOC MED
ECKHORN R, 1988, V60, P121, BIOL CYBERN
ERDI P, 1993, V69, P57, BIOL CYBERN
ERMENTROUT B, 1994, V6, P225, NEURAL COMPUT
ERMENTROUT GB, 1990, V50, P125, SIAM J APPL MATH
GRAY CM, 1994, V1, P11, J COMPUT NEUROSCI
GRAY CM, 1989, V338, P334, NATURE
HOPPENSTEADT FC, 1993, ANAL SIMULATIONS CHA
HOPPENSTEADT FC, 1991, V29, P689, J MATH BIOL
HOPPENSTEADT FC, 1989, V86, P2991, P NATL ACAD SCI USA
HOPPENSTEADT FC, 1995, V1, P80, WORLD C NEUR NETW WA
HOPPENSTEDT FC, 1996, V75, P129, BIOL CYBERN
IZHIKEVICH EM, 1996, THESIS MICHIGAN STAT
KAZANOVICH YB, 1994, V71, P177, BIOL CYBERN
KOPELL N, 1986, LECT NOTES BIOMATHEM
KOWALSKI JM, 1992, V5, P805, NEURAL NETWORKS
KRYUKOV VI, 1991, V1, P319, NEUROCOMPUTERS ATTEN
LI Z, 1989, V61, P379, BIOL CYBERN
NEU JC, 1979, V37, P307, SIAM J APPL MATH
RAKIC P, 1976, LOCAL CIRCUIT NEURON
RAPAPORT A, 1952, V14, P35, B MATH BIOPHYS
SCHUSTER HG, 1990, V64, P77, BIOL CYBERN
SHEPHERD GM, 1976, LOCAL CIRCUIT NEURON
SHEPHERD GM, 1983, NEUROBIOLOGY
SKARDA CA, 1987, V10, P161, BEHAV BRAIN SCI
VONDERMALSBURG C, 1992, V67, P233, BIOL CYBERN
WILSON HR, 1972, V12, P1, BIOPHYS J
WILSON HR, 1973, V13, P55, KYBERNETIK
ZAK M, 1989, V3, P131, APPL MATH LETT

1/5/117 (Item 40 from file: 34)

DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

04690224 Genuine Article#: UB374 Number of References: 25

Title: AN AVERAGING PRINCIPLE FOR DYNAMICAL-SYSTEMS IN HILBERT-SPACE WITH MARKOV RANDOM PERTURBATIONS

Author(s): **HOPPENSTEADT F** ; SALEHI H; SKOROKHOD A

Corporate Source: MICHIGAN STATE UNIV,DEPT STAT & PROBABIL/E LANSING//MI/48824; MICHIGAN STATE UNIV,DEPT STAT & PROBABIL/E LANSING//MI/48824; UKRAINIAN ACAD SCI,INST MATH/KIEV//UKRAINE/

Journal: STOCHASTIC PROCESSES AND THEIR APPLICATIONS, 1996, V61, N1 (JAN), P85-108

ISSN: 0304-4149

Language: ENGLISH Document Type: ARTICLE

Geographic Location: USA; UKRAINE

Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences

Journal Subject Category: STATISTICS & PROBABILITY

Abstract: We study the asymptotic behavior of solutions of differential equations dx(epsilon)(t)/dt = A(y(t/epsilon))x(epsilon)(t),

x(epsilon)(0)) = x(0), where A(y), for y in a space Y, is a family of operators forming the generators of semigroups of bounded linear operators in a Hilbert space H, and y(t) is an ergodic jump Markov process in Y. Let (A) over bar = integral A(y)rho(dy) where rho(dy) is the ergodic distribution of y(t). We show that under appropriate conditions as epsilon-->0 the process x(epsilon)(t) converges uniformly in probability to the nonrandom function (x) over bar(t) which is the solution of the equation d (x) over bar(t)/dt = (A) over bar (x) over bar(t), (x) over bar(0) = x(0) and that epsilon(-1/2)(x(epsilon)(t) - (x) over bar(t)) converges weakly to a Gaussian random function (x) over tilde(t) for which a representation is obtained. Application to randomly perturbed partial differential equations with nonrandom initial and boundary conditions are included.

Descriptors--Author Keywords: STOCHASTIC DYNAMICAL SYSTEMS ; METHOD OF AVERAGING ; MARKOVIAN PERTURBATIONS ; ASYMPTOTIC EXPANSION ; PARTIAL DIFFERENTIAL EQUATIONS

Research Fronts: 94-6826 002 (MARKOV DIFFUSIONS; FUNCTIONAL APPROXIMATION THEOREMS; ASSET PRICING; LEVY FLOWS; LOCAL MARTINGALES; LARGE DEVIATIONS; CONTINUOUS-TIME STOCHASTIC-PROCESSES)
94-5278 001 (CONVERGENCE OF MEASURE-VALUED PROCESSES; SUPER BROWNIAN-MOTION; OCCUPATION TIME APPROACH)

Cited References:

BAMBAKADIS G, 1981, METAL HYDRIDES
BOGOLUBOV NN, 1939, V4, P5, CONTR KATH MATH PHYS
BOGOLUBOV NN, 1945, SOME STATISTICAL MET
ETHIER SN, 1986, MARKOV PROCESSES
FREIDLIN MI, 1979, RANDOM PERTURBATIONS
GIKHMAN II, 1950, V2, P37, UKR MATH J
GIKHMAN II, 1951, V3, P317, UKR MATH J
GIKHMAN II, 1964, P41, WINT SCH PROBABILITY
HOPPENSTEADT F, 1994, V2, P61, RANDOM OPER STOCH EQ
JACOD J, 1987, LIMIT THEOREMS STOCH
KHASMINSKII RZ, 1968, V4, P260, KYBERNETIKA PRAGUE
KHASMINSKII RZ, 1968, STOCHASTIC STABILITY
KHASMINSKII RZ, 1966, V11, P240, TEOR VEROYA PRIMEN
KRYLOV NN, 1979, P71, ITOGI NAUKI TECHNIKI
MUELLER WM, 1968, METAL HYDRIDES
PAPANICOLAOU GC, 1975, V81, P330, B AM MATH SOC
PAPANICOLAOU GC, 1977, V3, DUKE U MATH SERIES
PARDOUX E, 1977, V636, P165, LECT NOTES MATH
PROTTER PH, 1990, STOCHASTIC INTEGRATI
ROZOVSKII BL, 1985, EVOLUTIONARY STOCHAS
RUBINOW SI, 1973, V10, P54, CBMS
SARAFYAN VV, 1987, V32, P658, TEOR VEROYA PRIMEN
SKOROKHOD AV, 1989, ASYMPTOTIC METHODS T
SKOROKHOD AV, 1984, RANDOM LINEAR OPERAT
SKOROKHOD AV, 1965, STUDIES THEORY RANDO

1/5/118 (Item 41 from file: 34)

04689915 Genuine Article#: UB427 Number of References: 60

Title: CONDITIONS FOR SYMPATRIC SPECIATION - A DIPLOID MODEL INCORPORATING HABITAT FIDELITY AND NON-HABITAT ASSORTATIVE MATING

Author(s): JOHNSON PA; **HOPPENSTEADT FC** ; SMITH JJ; BUSH GL
Corporate Source: SWEDISH UNIV AGR SCI,DEPT PLANT BREEDING RES,BOX 7003/S-75007 UPPSALA//SWEDEN/; MICHIGAN STATE UNIV,CTR MICROBIAL ECOL,NSF/E LANSING//MI/48824; MICHIGAN STATE UNIV,DEPT MATH,DEPT STAT & PROBABIL/E LANSING//MI/48824; MICHIGAN STATE UNIV,NSF,CTR MICROBIAL ECOL/E LANSING//MI/48824; MICHIGAN STATE UNIV,DEPT ZOOL/E LANSING//MI/48824; MICHIGAN STATE UNIV,DEPT ZOOL,DEPT ENTOMOL/E LANSING//MI/48824

Journal: EVOLUTIONARY ECOLOGY, 1996, V10, N2 (MAR), P187-205
ISSN: 0269-7653
Language: ENGLISH Document Type: ARTICLE

Geographic Location: SWEDEN; USA
Subfile: SciSearch; CC AGRI--Current Contents, Agriculture, Biology & Environmental Sciences
Journal Subject Category: GENETICS & HEREDITY; ECOLOGY; BIOLOGY
Abstract: Three types of genes have been proposed to promote sympatric speciation: habitat preference genes, assortative mating genes and habitat-based fitness genes. Previous computer models have analysed these genes separately or in pairs. In this paper we describe a multilocus model in which genes of all three types are considered simultaneously. Our computer simulations show that speciation occurs in complete sympatry under a broad range of conditions. The process includes an initial diversification phase during which a slight amount of divergence occurs, a quasi-equilibrium phase of stasis during which little or no detectable divergence occurs and a completion phase during which divergence is dramatic and gene flow between diverging habitat morphs is rapidly eliminated. Habitat preference genes and habitat-specific fitness genes become associated when assortative mating occurs due to habitat preference, but interbreeding between individuals adapted to different habitats occurs unless habitat preference is almost error free. However, 'non-habitat assortative mating', when coupled with habitat preference can eliminate this interbreeding. Even when several loci contribute to the probability of expression of non-habitat assortative mating and the contributions of individual loci are small, gene flow between diverging portions of the population can terminate within less than 1000 generations.
Descriptors--Author Keywords: SPECIATION ; HABITAT-SYMPATRIC DIVERGENCE ; DIVERGENT SELECTION ; HABITAT PREFERENCE ; ASSORTATIVE MATING ; LINKAGE DISEQUILIBRIUM ; PENETRANCE
Identifiers--KeyWords Plus: SUBDIVIDED POPULATIONS; REPRODUCTIVE ISOLATION; PHEROMONE PRODUCTION; EVOLUTION; DISEQUILIBRIUM; DIVERGENCE; SIMULATION; PREFERENCE; SELECTION; ANIMALS
Research Fronts: 94-3929 003 (QUANTITATIVE GENETICS OF BRYOZOAN PHENOTYPIC EVOLUTION; DROSOPHILA SIBLING SPECIES; SYMPATRIC SPECIATION; HALDANES RULE IN FLOUR BEETLES; RANDOM CHANGE)
Cited References:
BARTON NH, 1984, V15, P133, ANNU REV ECOL SYST
BARTON NH, 1988, V336, P13, NATURE
BUSH GL, 1969, V23, P237, EVOLUTION
BUSH GL, 1992, P229, EVOLUTIONARY PATTERN
BUSH GL, 1986, P411, EVOLUTIONARY PROCESS
BUSH GL, 1975, P187, EVOLUTIONARY STRATEG
BUSH GL, 1982, P119, PERSPECTIVES EVOLUTI
CRAWFORD DJ, 1992, V79, P962, AM J BOT
DEMEEUS T, 1993, V7, P175, EVOL ECOL
DICKINSON H, 1973, V107, P256, AM NAT
DIEHL SR, 1989, P345, SPECIATION ITS CONSE
FEDER JL, 1989, V51, P113, ENTOMOL EXP APPL
FELSENSTEIN J, 1981, V35, P124, EVOLUTION
FIALKOWSKI KR, 1988, V130, P379, J THEOR BIOL
FIALKOWSKI KR, 1992, V157, P9, J THEOR BIOL
FUTUYMA DJ, 1986, EVOLUTIONARY BIOL
FUTUYMA DJ, 1980, V29, P254, SYST ZOOL
GIBBONS JRH, 1979, V114, P719, AM NAT
GRANT PR, 1986, ECOLOGY EVOLUTION DA
GRULA JW, 1979, V42, P359, HEREDITY
HALDANE JBS, 1930, V64, P87, AM NAT
HEATWOLE H, 1965, V46, P140, ECOLOGY
HUTCHINSON GE, 1968, P177, POPULATION BIOL EVOL
KONDRASHOV AS, 1986, V27, P201, BIOL J LINN SOC
KONDRASHOV AS, 1983, V24, P121, THEOR PAP BIOL
KONDRASHOV AS, 1983, V24, P121, THEOR POPUL BIOL
KONDRASHOV AS, 1986, V29, P1, THEOR POPUL BIOL
LACK D, 1947, DARWINS FINCHES
LEVENE H, 1953, V87, P331, AM NAT
LIBERMAN U, 1989, P111, MATH EVOLUTIONARY TH
MAYR E, 1963, ANIMAL SPECIES EVOLU
MOODY M, 1981, V11, P245, J MATH BIOL

MURRAY MG, 1990, V39, P434, ANIM BEHAV
NAGYLAKI T, 1980, V77, P4842, P NATL ACAD SCI USA
NEI M, 1973, V75, P213, GENETICS
PATERSON HEH, 1981, V77, P119, S AFRICA J SCI
PIMENTEL D, 1967, V101, P493, AM NAT
RAUSHER MD, 1984, V38, P596, EVOLUTION
RICE WR, 1987, V1, P301, EVOL ECOL
RICE WR, 1984, V38, P1251, EVOLUTION
RICE WR, 1990, V44, P1140, EVOLUTION
RKHA S, 1991, V88, P1835, P NATL ACAD SCI USA
ROELOFS W, 1987, V84, P7585, P NATL ACAD SCI USA
ROSENZWEIG ML, 1978, V10, P275, BIOL J LINN SOC
SEGER J, 1985, P43, EVOLUTION ESSAYS HON
SHAW RG, 1993, V47, P801, EVOLUTION
SLATKIN M, 1982, V36, P263, EVOLUTION
SMITH JM, 1966, V100, P637, AM NAT
SMITH JM, 1962, V195, P60, NATURE
SMITH JM, 1965, V30, P22, P R ENTOMOL SOC LOND
SMOUSE PE, 1977, V85, P733, GENETICS
SOANS AB, 1974, V108, P117, AM NAT
SVED JA, 1970, P289, MATH TOPICS POPULATI
TAUBER CA, 1977, V268, P702, NATURE
TAUBER CA, 1989, P307, SPECIATION ITS CONSE
TAYLOR OR, 1972, V26, P344, EVOLUTION
TEMPLETON AR, 1989, P3, SPECIATION ITS CONSE
WADE MJ, 1994, V72, P163, HEREDITY
WHITE MJD, 1978, MODES SPECIATION
WOOD TK, 1983, V220, P310, SCIENCE

1/5/119 (Item 42 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

03883232 Genuine Article#: QN934 Number of References: 7
Title: SINGULAR PERTURBATION SOLUTIONS OF NOISY SYSTEMS
Author(s): **HOPPENSTEADT FC**
Corporate Source: MICHIGAN STATE UNIV,DEPT MATH/E LANSING//MI/48824;
MICHIGAN STATE UNIV,DEPT STAT & PROBABIL/E LANSING//MI/48824
Journal: SIAM JOURNAL ON APPLIED MATHEMATICS, 1995, V55, N2 (APR), P544-551
ISSN: 0036-1399
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS, APPLIED
Abstract: Recent work on singular perturbation solutions that persist in the presence of noise is described. Two different settings are considered: small deviation theory in quasi-static problems, where there are small amplitude but highly irregular perturbations, and averaging problems where there are ergodic stochastic perturbations. In the first case, it is shown that quasi-static approx imations can be valid when the underlying problem experiences small deviation perturbations in problems that are stable under persistent disturbances. In the second, averaging principles are described for certain dynamical systems in Hilbert spaces that include applications to a wide variety of initial-boundary value problems for partial differential equations and for Volterra integral equations. These methods are applied here to four problems arising in applications.
Descriptors--Author Keywords: SINGULAR PERTURBATION METHODS ; STOCHASTIC INTEGRAL EQUATIONS
Cited References:
BAMBAKADIS G, 1981, METAL HYDRIDES
HASHMINSKII RZ, 1994, V2, P61, RANDOM OPERATORS STO
HOPPENSTEADT FC, 1993, ANAL SIMULATION CHAO
HOPPENSTEADT FC, 1975, V20, CBMS NSF C SERIES
HOPPENSTEADT FC, IN PRESS STOCHASTIC

HOPPENSTEADT FC, IN PRESS STOCHASTICS
RUBINOW SI, 1973, V10, P54, CBMS NSF C SERIES

1/5/120 (Item 43 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

03853816 Genuine Article#: QL761 Number of References: 22
Title: THEORETICAL-ANALYSIS OF DIVERGENCE IN MEAN FITNESS BETWEEN INITIALLY IDENTICAL POPULATIONS
Author(s): JOHNSON PA; LENSKI RE; **HOPPENSTEADT FC**
Corporate Source: SWEDISH UNIV AGR SCI,DEPT PLANT BREEDING RES/S-75007 UPPSALA//SWEDEN/; MICHIGAN STATE UNIV,CTR MICROBIAL ECOL/E LANSING//MI/48824; MICHIGAN STATE UNIV,DEPT MATH/E LANSING//MI/48824
Journal: PROCEEDINGS OF THE ROYAL SOCIETY OF LONDON SERIES B-BIOLOGICAL SCIENCES, 1995, V259, N1355 (FEB 22), P125-130
ISSN: 0962-8452
Language: ENGLISH Document Type: ARTICLE
Geographic Location: SWEDEN; USA
Subfile: SciSearch; CC LIFE--Current Contents, Life Sciences
Journal Subject Category: BIOLOGY
Abstract: Initially identical populations in identical environments may subsequently diverge from one another not only via the effects of genetic drift on neutral alleles, but also by selection on beneficial alleles that arise stochastically by mutation. In the simple case of one locus with two alleles in a haploid organism, a full range of combinations of population sizes, selection pressures, mutation rates and fixation probabilities reveals two qualitatively distinct dynamics of divergence among such initially identical populations. We define a non-dimensional parameter k that describes conditions for the occurrence of these different dynamics. One dynamic ($k > 1$) occurs when beneficial mutations are sufficiently common that substitutions within the populations are essentially simultaneous; the other dynamic ($k < 1$) occurs when beneficial mutations are so rare that substitutions are likely to occur as isolated events. If there are more than two alleles, or multiple loci, divergence among the populations can be sustained indefinitely if $k < 1$. The parameter k pertains to the nature of biological evolution and its tendency to be gradual or punctuated.
Identifiers--KeyWords Plus: SHIFTING-BALANCE THEORY; UNIFORM SELECTION; GENETIC-DIVERGENCE; ESCHERICHIA-COLI; EVOLUTION; ADAPTATION; DROSOPHILA; LINES
Cited References:
BENNETT AF, 1993, V47, P1, EVOLUTION
BULL JJ, 1992, V46, P882, EVOLUTION
COHAN FM, 1989, V134, P613, AM NAT
COHAN FM, 1984, V38, P495, EVOLUTION
COHAN FM, 1986, V114, P145, GENETICS
CROW JF, 1990, V44, P233, EVOLUTION
EWENS WJ, 1979, MATH POPULATION GENE
GOULD SJ, 1979, V204, P581, P R SOC LOND B
GOULD SJ, 1989, WONDERFUL LIFE BURGE
HALDANE JBS, 1927, V23, P838, P CAMBRIDGE PHILOS S
KORONA R, 1994, V91, P9037, P NATL ACAD SCI USA
LENSKI RE, 1991, V138, P1315, AM NAT
LENSKI RE, 1988, V42, P425, EVOLUTION
LENSKI RE, 1994, V91, P6808, P NATL ACAD SCI USA
MANI GS, 1990, V240, P29, P ROY SOC LOND B BIO
MORAN PAP, 1962, STATISTICAL PROCESSE
SPIESS EB, 1977, GENES POPULATIONS
TRAVISANO M, 1995, IN PRESS EVOLUTION
VASI F, 1994, V144, P432, AM NAT
WADE MJ, 1991, V253, P1015, SCIENCE
WALLACE B, 1968, P87, POPULATION BIOL EVOL
YIN J, 1993, V175, P1272, J BACTERIOL

1/5/121 (Item 44 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

03592441 Genuine Article#: PP871 Number of References: 4
Title: RESPONSE OF A SOLUTIVORY CHAIN TO A NUTRIENT PULSE
Author(s): **HOPPENSTEADT FC** ; JOHNSON PM
Corporate Source: MICHIGAN STATE UNIV,DEPT STAT & PROBABIL/E LANSING//MI/48824; MICHIGAN STATE UNIV,DEPT MATH/E LANSING//MI/48824; SWEDISH UNIV AGR SCI,DEPT PLANT BREEDING/S-75007 UPPSALA//SWEDEN/
Journal: JOURNAL OF MATHEMATICAL BIOLOGY, 1994, V32, N8 (OCT), P865-867
ISSN: 0303-6812
Language: ENGLISH Document Type: NOTE
Geographic Location: USA; SWEDEN
Subfile: SciSearch; CC LIFE--Current Contents, Life Sciences
Journal Subject Category: BIOLOGY, MISCELLANEOUS; MATHEMATICS, MISCELLANEOUS
Abstract: A microbial community model is proposed that accounts for byproducts of one strain being nutrients for another and for cells passing in and out of states of torpor. It is shown that such models can sustain the propagation of a nutrient pulse as observed, for example, in methanogenesis.
Descriptors--Author Keywords: DYNAMICAL SYSTEMS ; MICROBIAL ECOLOGY
Cited References:
CHIU C, IN PRESS J MATH BIOL
LEE SS, 1975, V9, P491, WATER RES
LENSKI R, 1992, ENCY MCIROBIOLOGY
SIMKINS S, 1991, COMMUNICATION

1/5/122 (Item 45 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

03592439 Genuine Article#: PP871 Number of References: 13
Title: ANALYSIS AND COMPUTER-SIMULATION OF ACCRETION PATTERNS IN BACTERIAL CULTURES
Author(s): CHIU CC; **HOPPENSTEADT FC** ; JAGER W
Corporate Source: MICHIGAN STATE UNIV,DEPT MATH/E LANSING//MI/48824; UNIV HEIDELBERG,INST APPL MATH/D-69120 HEIDELBERG//GERMANY/
Journal: JOURNAL OF MATHEMATICAL BIOLOGY, 1994, V32, N8 (OCT), P841-855
ISSN: 0303-6812
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA; GERMANY
Subfile: SciSearch; CC LIFE--Current Contents, Life Sciences
Journal Subject Category: BIOLOGY, MISCELLANEOUS; MATHEMATICS, MISCELLANEOUS
Abstract: Patterned growth of bacteria created by interactions between the cells and moving gradients of nutrients and chemical buffers is observed frequently in laboratory experiments on agar pour plates. This has been investigated by several microbiologists and mathematicians usually focusing on some hysteretic mechanism, such as dependence of cell uptake kinetics on pH. We show here that a simpler mechanism, one based on cell torpor, can explain patterned growth. In particular, we suppose that the cell population comprises two subpopulations one actively growing and the other inactive. Cells can switch between the two populations depending on the quality of their environment (nutrient availability, pH, etc.) We formulate here a model of this system, derive and analyze numerical schemes for solving it, and present several computer simulations of the system that illustrate various patterns formed. These compare favorably with observed experiments.
Descriptors--Author Keywords: MATHEMATICAL MODELS ; PATTERN FORMATION ; NUMERICAL METHODS ; COMPUTER SIMULATION
Research Fronts: 92-0150 001 (TURING PATTERNS; RAYLEIGH-BENARD CONVECTION; SPATIAL BISTABILITY; NONLINEAR DYNAMICS)
92-3200 001 (SCALAR REACTION-DIFFUSION EQUATION; SPATIAL DYNAMICS; EXISTENCE OF CHEMICAL WAVES)

Cited References:

BRITTON NE, 1986, REACTION DIFFUSION E
BUDRIENE EO, 1983, V135, P323, J THEOR BIOL
CHIU C, IN PRESS EXISTENCE U
GERHARDT P, 1981, MANUAL METHODS GENER
HOPPENSTEADT FC, 1980, V38, P68, LECT NOTES BIOMATH
HOPPENSTEADT FC, 1982, MATH METHODS POPULAT
LEWIS DL, 1991, V57, P27, ASM NEWS
LIEBERSTEIN HM, 1972, THEORY PARTIAL DIFFE
MONOD J, 1942, RECHERCHES CROISSANC
MURRAY JD, 1989, MATH BIOL MATH TEXTS
SHEHATA TE, 1970, V103, P789, J BACTERIOL
STRIKWERDA JC, 1989, FINITE DIFFERENCE SC
WIMPENNY JWT, 1981, V127, P277, J GEN MICROBIOL

1/5/123 (Item 46 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

03113451 Genuine Article#: ND340 Number of References: 14
Title: A PARTICLE METHOD FOR POPULATION WAVES
Author(s): CHIU CC; **HOPPENSTEADT FC**
Corporate Source: MICHIGAN STATE UNIV,DEPT MATH/E LANSING//MI/48824
Journal: SIAM JOURNAL ON APPLIED MATHEMATICS, 1994, V54, N2 (APR), P466-477
ISSN: 0036-1399
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS, APPLIED
Abstract: Phase models are useful for studying synchronization of bacterial cell culture growth and other biological events associated with cell cycles. This paper considers a model that allows the growth rate of cells to change at different phases of cell cycle. In this paper, a particle method is derived for solving the weak formulation of this model, and convergence of the particle method is proved.
Descriptors--Author Keywords: MATHEMATICAL MODELS FOR CELL POPULATIONS ; WEAK SOLUTIONS ; PARTICLE METHODS ; VORTEX METHODS ; ERROR ESTIMATE
Research Fronts: 92-1151 001 (VORTEX PAIR; 2-DIMENSIONAL TURBULENCE; INTERACTION OF STEEP WAVES; POINT VORTICES; CONTOUR DYNAMICS; SOUTHERN BAY)
Cited References:

BERNARDELLI H, 1942, V31, P1, J BURMA RES SOC
CHIU C, IN PRESS MATH MODELS
CHIU C, 1992, P WORLD C NONLINEAR
HOPPENSTEADT FC, 1987, V81, P16, LECTURE NOTES BIOMAT
INGRAHAM JL, 1983, GROWTH BACTERIAL CEL
JOSELEAUPETIT D, 1984, V139, P605, EUR J BIOCHEM
KEPES F, 1980, V131, P3, ANN MICROBIOL
KEPES F, 1981, V99, P761, BIOCHEM BIOPH RES CO
LEONARD A, 1980, V37, P289, J COMPUT PHYS
MARTIN E, 1979, V30, LECTURE NOTES BIOMAT
RAVIART A, 1985, V1127, LECTURE NTOES MATH
RUBINOW SI, 1975, INTRO MATH BIOL
RUBINOW SI, 1973, V10, REGIONAL C SERIES AP
STANIER RY, 1976, MICROBIAL WORLD

1/5/124 (Item 47 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

02121431 Genuine Article#: KA788 Number of References: 9
Title: ON THE POSSIBLE ROLE OF CHAOS IN NEURAL SYSTEMS
Author(s): **IZHIKEVICH EM** ; MALINETSKY GG
Corporate Source: MV KELDYSH APPL MATH INST/MOSCOW//USSR/; RUSSIAN OPEN

UNIV/MOSCOW//USSR/
Journal: DOKLADY AKADEMII NAUK, 1992, V326, N4, P626-632
ISSN: 0002-3264
Language: RUSSIAN   Document Type: ARTICLE
Geographic Location: UNION OF SOVIET SOCIALIST REPUBLICS
Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MULTIDISCIPLINARY SCIENCES
Identifiers--KeyWords Plus: DYNAMICS; NETWORKS; MODEL
Research Fronts: 90-0072 001   (CORTICAL SOMATOSENSORY EVOKED-POTENTIALS; STIMULUS-DEPENDENT NEURONAL OSCILLATIONS IN CAT VISUAL-CORTEX; NEURAL NETWORKS; BRAIN MAPPING; MEDIAN NERVE SEP)
90-0801 001   (NEURAL NETWORKS; IDENTIFIED APLYSIA NEURONS EXHIBIT MULTIPLE PATTERNS OF PERSISTENT ACTIVITY; HEBB RULE FOR LEARNING BOOLEAN FUNCTIONS)
Cited References:
BABLOYANTZ A, 1985, V111, P152, PHYS LETT A
FREEMAN WJ, 1987, V56, P139, BIOL CYBERN
HIRSCH MW, 1989, V2, P331, NEURAL NETWORKS
HOPFIELD JJ, 1982, V79, P2554, P NATIONAL ACADEMY S
SHEPHERD GM, 1990, SYNAPTIC ORG BRAIN
SKARDA CA, 1987, V10, P161, BEHAV BRAIN SCI
SPARROW C, 1982, V41, APPLIED MATH SCI
TSUDA I, 1992, IN PRESS NEURAL NETW
YAO Y, 1990, V3, P153, NEURAL NETWORKS

1/5/125   (Item 48 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

01920140   Genuine Article#: JM132   Number of References: 56
Title: SIGNAL-PROCESSING BY MODEL NEURAL NETWORKS
Author(s): **HOPPENSTEADT FC**
Corporate Source: MICHIGAN STATE UNIV,DEPT MATH/E LANSING//MI/48824; MICHIGAN STATE UNIV,DEPT STAT & PROBABIL/E LANSING//MI/48824
Journal: SIAM REVIEW, 1992, V34, N3 (SEP), P426-444
ISSN: 0036-1445
Language: ENGLISH   Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS, APPLIED
Abstract: Voltage controlled oscillator model neurons (VCONs) are electronic circuits that are similar to phase locked loops, but designed to account for certain experimental observations of neurons. They are constructible electronic circuits, and they provide teaching tools that involve (relatively) simple mathematical models based on brilliant circuits designed by engineers. The model makes accessible the study of phase locking, an important physical phenomenon that makes possible stable frequency-encoded information processing even in the presence of noise. VCONs also enable the design of networks of circuits that might be useful as analog control devices in robotics, give interesting examples of rotation vectors in high-order dynamical systems, and can process, store, and recognize frequency-encoded information.

Presented here are several VCON networks motivated by observations by physiologists. They fire bursting patterns similar to neural circuits in the thalamus and reticular complex of mammalian brains; they reproduce searchlight behavior that is speculated to be a mechanism by which a brain focuses attention on one among many competing stimuli; they convert a temporal signal into a spatial pattern of phase locked firing, similar to a tonotopic mapping in mammalian auditory systems; they store frequency-encoded information in autocorrelating filters that are similar to neurotransmitter synapses at chemical equilibrium; and they recognize stored signals by

cross-correlation with new inputs.
These networks and their computer simulations are presented here.
Descriptors--Author Keywords: VCON ; TONOTOPE ; SEARCHLIGHT HYPOTHESIS ; NONLINEAR OSCILLATORS ; PHASE LOCKED LOOPS ; ANALOG CONTROL CIRCUITS, FOURIER ANALYSIS ; ATTENTION ; HOLOGRAPHIC RECALL ; CADENCE
Identifiers--KeyWords Plus: SEARCHLIGHT HYPOTHESIS; PATTERNS; NEURONS
Research Fronts: 90-0801 002 (NEURAL NETWORKS; IDENTIFIED APLYSIA NEURONS EXHIBIT MULTIPLE PATTERNS OF PERSISTENT ACTIVITY; HEBB RULE FOR LEARNING BOOLEAN FUNCTIONS)
90-0510 001 (CEREBELLAR PURKINJE-CELLS; EXCITATORY SYNAPTIC CURRENTS; DEVELOPMENT OF OLIVOCEREBELLAR FIBERS)
90-0670 001 (UNIFORM ANISOTROPIC CANINE VENTRICULAR MUSCLE; CALCIUM CHANNELS; RABBIT CARDIAC PURKINJE-FIBERS; INITIATION OF REENTRANT ATRIAL ARRHYTHMIAS)
90-6805 001 (CA1 PYRAMIDAL NEURONS; SYNAPTIC INTEGRATION; MEMBRANE VOLTAGE CHANGES; WHITE MATTER STIMULATION; HIPPOCAMPAL SLICES; LIGHT RESPONSE; ELECTROTONIC SPREAD)
Cited References:

BRAIN USERS MANUAL, 1980
ANDRONOV AA, 1966, THEORY OSCILLATORS
BERTHOMMIER F, 1989, V309, P695, CR ACAD SCI III-VIE
BESICOVITCH AS, 1932, ALMOST PERIODIC FUNC
CONNORS BW, 1990, V13, P99, TRENDS NEUROSCI
CRICK F, 1984, V81, P4586, P NATL ACAD SCI USA
FITZHUGH R, 1962, P1, BIOL ENG
FLAHERTY JE, 1978, V56, P5, STUD APPL MATH
FRANKS J, 1989, V311, P107, T AM MATH SOC
GABOR D, 1968, V217, P1288, NATURE
GRASMAN J, 1979, V7, P171, J MATH BIOL
GREENBERG JM, 1978, V34, P515, SIAM J APPL MATH
GUTTMAN R, 1980, V56, P9, J MEMBRANE BIOL
HAYASHI C, 1985, NONLINEAR OSCILLATIO
HILL AV, 1936, V121, P74, P ROY SOC LOND B BIO
HODGKIN AL, 1952, V116, P500, J PHYSIOL-LONDON
HOLDEN AV, 1976, V21, P1, BIOL CYBERN
HOPFIELD JJ, 1982, V79, P2554, P NATIONAL ACADEMY S
HOPPENSTEADT FC, 1986, INTRO MATH NEURONS
HOPPENSTEADT FC, 1982, V15, P339, J MATH BIOL
HOPPENSTEADT FC, 1991, V29, P689, J MATH BIOL
HOPPENSTEADT FC, 1992, MATH MED LIFE SCI
HOPPENSTEADT FC, 1989, V86, P2991, P NATL ACAD SCI USA
HOROWITZ P, 1989, ART ELECTRONICS
HUYGENS J, 1665, OEUVRES COMPLETES
KLEENE SC, 1952, METAMATHEMATICS
KNIGHT BW, 1972, V59, P734, J GEN PHYSIOL
KRYUKOV VI, 1990, STOCHASTIC CELLULAR
KUFFLER SW, 1984, NEURON BRAIN
LAPICQUE L, 1907, V9, P620, J PHYSIOL PATH GEN
LONGUETHIGGINS HC, 1968, V217, P104, NATURE
MCCULLOCH WS, 1943, V5, P115, B MATH BIOPHYS
MOE GK, 1964, V67, P200, AM HEART J
NIJHOFF M, 1893, V5, P243, HAYE
PALAY SL, 1974, CEREBELLAR CORTEX CY
PATTON HD, 1989, V1, TXB PHYSL
PERKEL D, 1964, V163, P61, SCIENCE
RALL W, 1977, V1, P39, HDB PHYSL 1
ROOT WL, 1966, V72, P126, B AM MATH SOC
RUMELHART D, 1990, NEUROSCIENCE CONNECT
SELVERSTON A, 1989, COMPUTING NEURON
STERIADE M, 1990, THALAMIC OSCILLATION
STOKER JJ, 1950, NONLINEAR VIBRATIONS
STREHLER BL, 1986, V83, P9812, P NATL ACAD SCI USA
TRAUB R, 1991, NEURONAL NETWORKS HI
TURING AM, 1936, V5, P230, P LOND MATH SOC
VANDERPOL B, 1928, V6, P763, PHIL MAG 7
VANDERPOL B, 1926, V2, P978, PHILOS MAG
VINOGRADOVA OS, 1990, V5, P129, NEUROCOMPUTERS ATTEN

VONEULER C, 1980, P275, TRENDS NEUROSCI
VONKARMAN T, 1940, V46, P615, B AM MATH SOC
VONNEUMANN J, 1958, COMPUTER BRAIN
WIENER N, 1946, V16, P230, ARCH I CARDIOL MEX
WIENER N, 1961, CYBERNETICS
WINFREE A, 1987, TIME BREAKS DOWN
YOUNG ED, 1979, V66, P1381, J ACOUST SOC AM

1/5/126 (Item 49 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

01358437 Genuine Article#: GR695 Number of References: 0
Title: MATHEMATICAL ASPECTS OF MICROBIAL ECOLOGY
Author(s): **HOPPENSTEADT F** ; LAUFFENBURGER DA; WALTMAN P
Corporate Source: MICHIGAN STATE UNIV,SCH NAT SCI/E LANSING//MI/48824; UNIV ILLINOIS,DEPT CHEM ENGN/URBANA//IL/61801; EMORY UNIV/ATLANTA//GA/30322
Journal: MICROBIAL ECOLOGY, 1991, V22, N2, P109-110
Language: ENGLISH Document Type: EDITORIAL
Geographic Location: USA
Subfile: SciSearch; CC AGRI--Current Contents, Agriculture, Biology & Environmental Sciences
Journal Subject Category: ECOLOGY

1/5/127 (Item 50 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

01241158 Genuine Article#: GH301 Number of References: 14
Title: MEMORY, LEARNING AND NEUROMEDIATORS
Author(s): **IZHIKEVICH EM** ; MIKHAILOV AS; SVESHNIKOV NA
Corporate Source: UNIV STUTTGART,INST THEORET PHYS & SYNERGET,PFAFFENWALDRING 57 4/D-7000 STUTTGART 80//FED REP GER/; UNIV STUTTGART,INST THEORET PHYS & SYNERGET,PFAFFENWALDRING 57 4/D-7000 STUTTGART 80//FED REP GER/; MV LOMONOSOV STATE UNIV,DEPT PHYS/MOSCOW 117234//USSR/
Journal: BIOSYSTEMS, 1991, V25, N4, P219-229
Language: ENGLISH Document Type: ARTICLE
Geographic Location: FEDERAL REPUBLIC OF GERMANY; UNION OF SOVIET SOCIALIST REPUBLICS
Subfile: SciSearch; CC LIFE--Current Contents, Life Sciences
Journal Subject Category: BIOLOGY
Abstract: We consider a model of a neural network where the individual cells interact only by releasing and absorbing the molecules of a neuromediator. We show that such a system can realize the function of associative memory. A learning mechanism based on the chemotaxis is proposed and numerically investigated.
Descriptors--Author Keywords: NEURON; NEUROMEDIATOR; DIFFUSION; MEMORY; LEARNING; CHEMOTAXIS
Identifiers--KeyWords Plus: NEURAL NETWORKS
Research Fronts: 89-0174 004 (NEURAL NETWORKS; ASSOCIATIVE MEMORY; NEURONAL MODELS OF COGNITIVE FUNCTIONS)
Cited References:
AMIT DJ, 1985, V32, P1007, PHYS REV A
BERRY M, 1982, V20, P451, NEUROSCI RES PROG B
HEBB DO, 1949, ORG BEHAVIOR
HOPFIELD JJ, 1982, V79, P2554, P NATIONAL ACADEMY S
HUCHO F, 1986, NEUROCHEMISTRY
KOHONEN T, 1980, CONTENT ADDRESSABLE
KOKETSU K, 1984, V34, P945, JPN J PHYSIOL
MACGREGOR RJ, 1987, NEURAL BRAIN MODELLI
MACGREGOR RJ, 1977, NEURAL MODELLING
MCCULLOCH WS, 1943, V5, P115, B MATH BIOPHYS
MIKHAILOV AS, 1990, V23, P291, BIOSYSTEMS
MIKHAILOV AS, 1990, V1, F SYNERGETICS

MIKHAILOV AS, 1990, V1, IN PRESS J NONLINEAR
SHEPHERD GM, 1983, NEUROBIOLOGY

1/5/128 (Item 51 from file: 34)
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

01117693 Genuine Article#: FY163 Number of References: 3
Title: THE SEARCHLIGHT HYPOTHESIS
Author(s): **HOPPENSTEADT FC**
Corporate Source: MICHIGAN STATE UNIV,DEPT MATH/E LANSING//MI/48824
Journal: JOURNAL OF MATHEMATICAL BIOLOGY, 1991, V29, N7, P689-691
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC LIFE--Current Contents, Life Sciences
Journal Subject Category: BIOLOGY, MISCELLANEOUS; MATHEMATICS, MISCELLANEOUS
Research Fronts: 89-0469 001 (DIVIDED ATTENTION; VISUAL FORM PERCEPTION; FEATURE INTEGRATION; MECHANISMS OF UNILATERAL SPATIAL NEGLECT; DUAL-TASK PERFORMANCE; ILLUSORY CONJUNCTIONS)
Cited References:
CRICK F, 1984, V81, P4586, P NATL ACAD SCI USA
DOBRUSHIN RL, 1990, STOCHASTIC CELLULAR
HOPPENSTEADT FC, 1986, INTRO MATH NEURONS

1/5/129 (Item 1 from file: 35)
DIALOG(R)File 35:Dissertation Abs Online

270565 ORDER NO: AAD65-06218
SINGULAR PERTURBATIONS ON THE INFINITE INTERVAL
Author: **HOPPENSTEADT, FRANK CHARLES**
Degree: PH.D.
Year: 1965
Corporate Source/Institution: THE UNIVERSITY OF WISCONSIN - MADISON (0262)
Source: VOLUME 25/12 OF DISSERTATION ABSTRACTS INTERNATIONAL. PAGE 7295. 51 PAGES
Descriptors: MATHEMATICS
Descriptor Codes: 0405

1/5/130 (Item 1 from file: 65)
DIALOG(R)File 65:Inside Conferences

03545445 INSIDE CONFERENCE ITEM ID: CN037349537
An oscillatory neural network model of sparse distributed memory and novelty detection
Borisyuk, R.; Denham, M.; **Hoppensteadt, F.** ; Kazanovich, Y.; Vinogradova, O.
CONFERENCE: Neuronal coding-International workshop
BIOSYSTEMS -AMSTERDAM-, 2000; VOL 58; NO 1-3 P: 265-272
Elsevier Science, 2000
ISSN: 0303-2647
LANGUAGE: English DOCUMENT TYPE: Conference Papers
CONFERENCE EDITOR(S): Sato, S.; Lansky, P.; Rospars, J.-P.
CONFERENCE LOCATION: Osaka, Japan 1999; Oct (199910) (199910)

BRITISH LIBRARY ITEM LOCATION: 2089.670000
DESCRIPTORS: neuronal coding

1/5/131 (Item 2 from file: 65)
DIALOG(R)File 65:Inside Conferences

03437677 INSIDE CONFERENCE ITEM ID: CN036271851
Neural Computations by Networks of Oscillators
Hoppensteadt, F. ; Izhikevich, E.
CONFERENCE: Neural networks-International joint conference
IEEE INTERNATIONAL CONFERENCE ON NEURAL NETWORKS, 2000; VOL 4 P: IV-41-IV-46
IEEE, 2000
ISSN: 1098-7576 ISBN: 0780365410; 0769506194
LANGUAGE: English DOCUMENT TYPE: Conference Papers
CONFERENCE EDITOR(S): Amari, S.-I.
CONFERENCE SPONSOR: International Neural Network Society
IEEE
European Neural Network Society
CONFERENCE LOCATION: Como, Italy
CONFERENCE DATE: Jul 2000

BRITISH LIBRARY ITEM LOCATION: 4362.949600
NOTE:
Also known as IJCNN 2000
DESCRIPTORS: neural networks; IJCNN

1/5/132 (Item 3 from file: 65)
DIALOG(R)File 65:Inside Conferences

02685669 INSIDE CONFERENCE ITEM ID: CN027953026
A Mini-FAB Simulation Model comparing FIFO and MIVP schedule policies (outer loop), and PID and H Machine Controllers (inner loop) for Semiconductor Diffusion Bay Maintenance
Flores-Godoy, J. J.; Wang, Y.; **Hoppensteadt, F.** ; Tsakalis, K.
CONFERENCE: Institute of Electrical and Electronics Engineers; Industrial Electronics Society: IECON '98-Annual conference; 24th
IECON -PROCEEDINGS-, 1998; VOL 1 P: 253-258
IEEE Service Center, 1998
ISBN: 0780345045; 0780345037; 0780345053
LANGUAGE: English DOCUMENT TYPE: Conference Papers
CONFERENCE SPONSOR: IEEE Industrial Electronics Society
CONFERENCE LOCATION: Aachen, Germany
CONFERENCE DATE: Aug 1998 (199808) (199808)

BRITISH LIBRARY ITEM LOCATION: 4362.696000
NOTE:
IEEE cat no 98CH36200 an 98CB36200
DESCRIPTORS: IECON; industrial electronics; IEEE

1/5/133 (Item 4 from file: 65)
DIALOG(R)File 65:Inside Conferences

02658279 INSIDE CONFERENCE ITEM ID: CN027679128
Thalamo-cortical interactions modeled by weakly connected oscillators: could the brain use FM radio principles?
Hoppensteadt, F. C. ; Izhikevich, E. M.
CONFERENCE: Neuronal coding-International workshop
BIOSYSTEMS -AMSTERDAM-, 1998; VOL 48; NUMBER 1/3 P: 85-94
Elsevier Science, 1998
ISSN: 0303-2647
LANGUAGE: English DOCUMENT TYPE: Conference Papers
CONFERENCE EDITOR(S): Rospars, J. P.
CONFERENCE LOCATION: Versailles, France
CONFERENCE DATE: Oct 1997 (199710) (199710)

BRITISH LIBRARY ITEM LOCATION: 2089.670000

DESCRIPTORS: neuronal coding

1/5/134 (Item 5 from file: 65)
DIALOG(R)File 65:Inside Conferences

02658270 INSIDE CONFERENCE ITEM ID: CN027679037
Memorizing recalling spatial-temporal patterns in an oscillator model of the hippocampus
Borisyuk, R. M.; **Hoppensteadt, F. C.**
CONFERENCE: Neuronal coding-International workshop
BIOSYSTEMS -AMSTERDAM-, 1998; VOL 48; NUMBER 1/3 P: 3-10
Elsevier Science, 1998
ISSN: 0303-2647
LANGUAGE: English DOCUMENT TYPE: Conference Papers
CONFERENCE EDITOR(S): Rospars, J. P.
CONFERENCE LOCATION: Versailles, France
CONFERENCE DATE: Oct 1997 (199710) (199710)

BRITISH LIBRARY ITEM LOCATION: 2089.670000
DESCRIPTORS: neuronal coding

1/5/135 (Item 6 from file: 65)
DIALOG(R)File 65:Inside Conferences

02111908 INSIDE CONFERENCE ITEM ID: CN021487757
Implementation of Minimum Inventory Variability Scheduling 1-Step Ahead Policy in a Large Semiconductor Manufacturing Facility
Williams, K.; Collins, D. W.; **Hoppensteadt, F. C.**
CONFERENCE: Emerging technologies and factory automation-International conference; 6th
IEEE INTERNATIONAL CONFERENCE ON EMERGING TECHNOLOGIES AND FACTORY AUTOMATION PROCEEDINGS, 1997; 6th P: 497-504
IEEE, 1997
ISBN: 0780341929; 0780341937
LANGUAGE: English DOCUMENT TYPE: Conference Papers
CONFERENCE SPONSOR: Institute of Electrical and Electronics Engineers Industrial Electronics Society
CONFERENCE LOCATION: Los Angeles, CA
CONFERENCE DATE: Sep 1997 (199709) (199709)

BRITISH LIBRARY ITEM LOCATION: 4362.948500
NOTE:
IEEE catalogue no 97TH8314
DESCRIPTORS: ETFA; emerging technologies; factory automation; IEEE

1/5/136 (Item 7 from file: 65)
DIALOG(R)File 65:Inside Conferences

02059118 INSIDE CONFERENCE ITEM ID: CN021544252
A particle method for population shock waves with application to synchronization of bacterial culture growth
Chiu, C.; **Hoppensteadt, F. C.**
CONFERENCE: World congress of nonlinear analysts-1st
WORLD CONGRESS OF NONLINEAR ANALYSTS, 1992; VOL 4 P: 3443-3454
Walter de Gruyter, 1996
ISBN: 311013215X
LANGUAGE: English DOCUMENT TYPE: Conference Papers
CONFERENCE EDITOR(S): Lakshmikantham, V.
CONFERENCE SPONSOR: International Federation of Nonlinear Analysts
CONFERENCE LOCATION: Tampa, FL
CONFERENCE DATE: Aug 1992 (199208) (199208)

BRITISH LIBRARY ITEM LOCATION: 9353.446800
DESCRIPTORS: nonlinear analysts; IFNA

1/5/137 (Item 8 from file: 65)
DIALOG(R)File 65:Inside Conferences

02037331 INSIDE CONFERENCE ITEM ID: CN021211216
Thalamo-Cortical Interactions Modeled by Forced Weakly Connected Oscillatory Networks
Hoppensteadt, F. ; Izhikevich, E.
CONFERENCE: Neural networks-IEEE international conference
IEEE INTERNATIONAL CONFERENCE ON NEURAL NETWORKS, 1997; VOL 1 P: 328-331
IEEE, 1997
ISBN: 0780341236; 0780341228; 0780341244
LANGUAGE: English DOCUMENT TYPE: Conference Papers
CONFERENCE SPONSOR: IEEE Neural Networks Council
CONFERENCE LOCATION: Houston, TX
CONFERENCE DATE: Jun 1997 (199706) (199706)

BRITISH LIBRARY ITEM LOCATION: 4362.949600
NOTE:
Also known as ICNN 97. IEEE cat nos 97CH36109 and 97CB36109 (on spine)
DESCRIPTORS: neural networks; IEEE

1/5/138 (Item 9 from file: 65)
DIALOG(R)File 65:Inside Conferences

02037330 INSIDE CONFERENCE ITEM ID: CN021211200
Canonical Models for Mathematical Neuroscience
Hoppensteadt, F. ; Izhikevich, E.
CONFERENCE: Neural networks-IEEE international conference
IEEE INTERNATIONAL CONFERENCE ON NEURAL NETWORKS, 1997; VOL 1 P: 324-327
IEEE, 1997
ISBN: 0780341236; 0780341228; 0780341244
LANGUAGE: English DOCUMENT TYPE: Conference Papers
CONFERENCE SPONSOR: IEEE Neural Networks Council
CONFERENCE LOCATION: Houston, TX
CONFERENCE DATE: Jun 1997 (199706) (199706)

BRITISH LIBRARY ITEM LOCATION: 4362.949600
NOTE:
Also known as ICNN 97. IEEE cat nos 97CH36109 and 97CB36109 (on spine)
DESCRIPTORS: neural networks; IEEE

1/5/139 (Item 10 from file: 65)
DIALOG(R)File 65:Inside Conferences

02037228 INSIDE CONFERENCE ITEM ID: CN021210186
Associative Memory of Weakly Connected Oscillators
Hoppensteadt, F. ; Izhikevich, E.
CONFERENCE: Neural networks-IEEE international conference
IEEE INTERNATIONAL CONFERENCE ON NEURAL NETWORKS, 1997; VOL 2 P: 1135-1138
IEEE, 1997
ISBN: 0780341236; 0780341228; 0780341244
LANGUAGE: English DOCUMENT TYPE: Conference Papers
CONFERENCE SPONSOR: IEEE Neural Networks Council
CONFERENCE LOCATION: Houston, TX
CONFERENCE DATE: Jun 1997 (199706) (199706)

BRITISH LIBRARY ITEM LOCATION: 4362.949600
NOTE:
Also known as ICNN 97. IEEE cat nos 97CH36109 and 97CB36109 (on spine)
DESCRIPTORS: neural networks; IEEE

1/5/140 (Item 11 from file: 65)
DIALOG(R)File 65:Inside Conferences

01330798 INSIDE CONFERENCE ITEM ID: CN013173034
Canonical Models for Bifurcations from Equilibrium in Weakly Connected Neural Networks
Hoppensteadt, F. C. ; Izhikevich, E.
CONFERENCE: WCNN'95-World congress on neural networks
WORLD CONGRESS ON NEURAL NETWORKS, 1995; VOL 1 P: I-80-I-83
Lawrence Erlbaum Associates, 1995
ISBN: 0805821252
LANGUAGE: English DOCUMENT TYPE: Conference Papers
CONFERENCE SPONSOR: International Neural Network Society
CONFERENCE LOCATION: Washington, DC
CONFERENCE DATE: Jul 1995 (19950) (19950)

BRITISH LIBRARY ITEM LOCATION: 9353.446480
NOTE:
Held as the annual meeting of the INNS
DESCRIPTORS: WCNN; neural networks; INNS

1/5/141 (Item 12 from file: 65)
DIALOG(R)File 65:Inside Conferences

01184449 INSIDE CONFERENCE ITEM ID: CN011619198
Persistence of Singular Perturbation Solutions in Noisy Environments
Hoppensteadt, F. C.
CONFERENCE: Trends and developments in ordinary differential equations-International symposium on ordinary differential equations and applications
P: 141-142
World Scientific, 1994
ISBN: 9810215304
LANGUAGE: English DOCUMENT TYPE: Conference Papers
CONFERENCE EDITOR(S): Alavi, Y.; Hsieh, P.-F.
CONFERENCE LOCATION: Kalamazoo, MI
CONFERENCE DATE: May 1993 (199305) (199305)

BRITISH LIBRARY ITEM LOCATION: 95/31713 Trends
DESCRIPTORS: ordinary differential equations

1/5/142 (Item 13 from file: 65)
DIALOG(R)File 65:Inside Conferences

00392367 INSIDE CONFERENCE ITEM ID: CN003737536
Simulation of Tonotopic Neural Circuit
Hoppensteadt, F. C.
CONFERENCE: Mathematics applied to biology and medicine-1st European congress
MATHEMATICS APPLIED TO BIOLOGY AND MEDICINE -EUROPEAN CONGRESS , 1991; 1st P: 125-130
Winnipeg, Wuerz Publishing, 1993
ISBN: 0920063632
LANGUAGE: English DOCUMENT TYPE: Conference Selected papers
CONFERENCE EDITOR(S): Demongeot, J.; Capasso, V. 1991 (199100) (199100)

BRITISH LIBRARY ITEM LOCATION: 5405.470000
NOTE:
Held at l'Alpe d'Huez
DESCRIPTORS: mathematics; biology; medicine

1/5/143 (Item 1 from file: 95)
DIALOG(R)File 95:TEME-Technology & Management

01424489 20000701702
Pattern recognition via synchronization in phase-locked loop neural networks
Hoppensteadt, FC ; Izhikevich, EM
Center for Syst. Sci. & Eng., Arizona State Univ., Tempe, AZ, USA
IEEE Transactions on Neural Networks, v11, n3, pp734-738, 2000
Document type: journal article Language: English
Record type: Abstract
ISSN: 1045-9227

ABSTRACT:
We propose a novel architecture of an oscillatory neural network that consists of phase-locked loop (PLL) circuits. It stores and retrieves complex oscillatory patterns as synchronized states with appropriate phase relations between neurons.

DESCRIPTORS: NEURAL CHIPS; IMAGE RECOGNITION; PHASE LOCKED LOOPS; SYNCHRONIZATION; VCO--VOLTAGE CONTROLLED OSCILLATORS
IDENTIFIERS: PHASENBEZIEHUNG; Neuronaler Chip; Bilderkennung

1/5/144 (Item 2 from file: 95)
DIALOG(R)File 95:TEME-Technology & Management

01402424 20000406070
Oscillatory model of the hippocampal memory
Borisyuk, R; **Hoppensteadt, F**
Plymouth Univ., UK
IJCNN'99. International Joint Conference on Neural Networks. Proceedings (Cat. No.99CH36339), 10-16 July 1999, Washington, DC, USA1999
Document type: Conference paper Language: English
Record type: Abstract
ISBN: 0-7803-5529-6

ABSTRACT:
We describe a biologically inspired oscillatory neural network for memorizing temporal sequences of neural activity patterns. The neural network consists of interactive neural oscillators with all-to-all excitatory connections forced by a slow T-periodic signal. The dynamics of the network are viewed through a time window with duration T. The network memorizes binary patterns in terms of low and high activity of the corresponding oscillators. The learning rule is temporally asymmetric, and it takes into account the activity level of pre- and post-'synaptic' oscillators in two contiguous time windows. Recall by the network is fast: all memorized patterns of sequences are reproduced in the correct order during the same time window, but with a short time delay. The applicability of these results to studies of the hippocampus is discussed.

DESCRIPTORS: ARTIFICIAL NEURAL NETWORKS; NEUROPHYSIOLOGY; DELAY TIME; SYSTEM THEORY
IDENTIFIERS: GEHIRNMODELL; ZEITLICHE FOLGE; ZEITFENSTER; LERNREGEL; Neuronales Netz; Neurologie

1/5/145 (Item 1 from file: 99)
DIALOG(R)File 99:Wilson Appl. Sci & Tech Abs

2694544 H.W. WILSON RECORD NUMBER: BAST03183376
Slowly Coupled Oscillators: Phase Dynamics and Synchronization
Izhikevich, Eugene M; **Hoppensteadt, Frank C**
SIAM Journal on Applied Mathematics v. 63 no6 (Aug./Sept. 2003) p. 1935-53
DOCUMENT TYPE: Feature Article ISSN: 0036-1399 LANGUAGE: English
RECORD STATUS: New record

ABSTRACT: In this paper we extend the results of Frankel and Kiemel [SIAM J. Appl. Math, 53 (1993), pp. 1436-1446] to a network of slowly coupled oscillators. First, we use Malkin's theorem to derive a canonical phase model that describes synchronization properties of a slowly coupled network. Then, we illustrate the result using slowly coupled oscillators (1) near Andronov-Hopf bifurcations, (2) near saddle-node on invariant circle bifurcations, and (3) near relaxation oscillations. We compare and contrast synchronization properties of slowly and weakly coupled oscillators. Reprinted by permission of the publisher.

DESCRIPTORS: Oscillations; Network synchronization;

1/5/146 (Item 2 from file: 99)
DIALOG(R)File 99:Wilson Appl. Sci & Tech Abs

2665762 H.W. WILSON RECORD NUMBER: BAST03170768
System of Phase Oscillators with Diagonalizable Interaction
Nishikawa, Takashi; **Hoppensteadt, Frank C**
SIAM Journal on Applied Mathematics v. 63 no5 (June/Aug. 2003) p. 1615-26
DOCUMENT TYPE: Feature Article ISSN: 0036-1399 LANGUAGE: English
RECORD STATUS: New record

ABSTRACT: We consider a system of N phase oscillators having randomly distributed natural frequencies and diagonalizable interactions among the oscillators. We show that, in the limit of N --> [infinity], all solutions of such a system are incoherent with probability one for any strength of coupling, which implies that there is no sharp transition from incoherence to coherence as the coupling strength is increased, in striking contrast to Kuramoto's (special) oscillator system. Reprinted by permission of the publisher.

DESCRIPTORS: Synchronization algorithms; Oscillators;

1/5/147 (Item 3 from file: 99)
DIALOG(R)File 99:Wilson Appl. Sci & Tech Abs

2621277 H.W. WILSON RECORD NUMBER: BAST03127454
Numerical and experimental investigation of the effect of filtering on chaotic symbolic dynamics
Zhu, Liqiang; Lai, Ying-Cheng; **Hoppensteadt, Frank C**
Chaos v. 13 no1 (Mar. 2003) p. 410-19
DOCUMENT TYPE: Feature Article ISSN: 1054-1500 LANGUAGE: English
RECORD STATUS: Corrected or revised record

ABSTRACT: Part of a special issue on the control and synchronization of chaotic dynamical systems. An investigation of the effect of filtering on chaotic symbolic dynamics is presented. Special attention is given to the linear, time-invariant filters that are frequently employed in many applications and to the 2 quantities representing chaotic symbolic dynamics: topological entropy and bit-error rate. Theoretical studies indicate that the topological entropy does not vary under filtering. As computation of this entropy requires that the generating partition for defining the symbolic dynamics be known, in practical situations the computed entropy may vary as a filtering parameter is varied. It was

found, via numerical computations and experiments with a chaotic electronic circuit, that with reasonable care the computed or measured entropy values can be preserved for a wide range of the filtering parameter.
DESCRIPTORS: Chaos (Science); Linear time varying systems; Bit error rates
;

1/5/148 (Item 4 from file: 99)
DIALOG(R)File 99:Wilson Appl. Sci & Tech Abs

2575332 H.W. WILSON RECORD NUMBER: BAST01024174
Synchronization of MEMS resonators and mechanical neurocomputing
Hoppensteadt, Frank C ; Izhikevich, Eugene M
IEEE Transactions on Circuits and Systems. Part I, Fundamental Theory and Applications v. 48 no2 (Feb. 2001) p. 133-8
DOCUMENT TYPE: Feature Article ISSN: 1057-7122 LANGUAGE: English
RECORD STATUS: Corrected or revised record

ABSTRACT: The authors developed a network of coupled microelectromechanical system (MEMS) oscillators that function as a neurocomputer with an oscillatory autocorrelative associative memory. The system is based on the fact that networks of arbitrary oscillators have associated memory when coupled appropriately. A canonical model describing the nonlinear dynamics of a single MEMS oscillator is presented and a network of such oscillators is considered. The theory is applied to a pattern recognition problem.

DESCRIPTORS: MEMS resonators; Neural networks; Associative memories;

1/5/149 (Item 5 from file: 99)
DIALOG(R)File 99:Wilson Appl. Sci & Tech Abs

2230454 H.W. WILSON RECORD NUMBER: BAST00079768
Pattern recognition via synchronization in phase-locked loop neural networks
Hoppensteadt, Frank C ; Izhikevich, Eugene M
IEEE Transactions on Neural Networks v. 11 no3 (May 2000) p. 734-8
DOCUMENT TYPE: Feature Article ISSN: 1045-9227 LANGUAGE: English
RECORD STATUS: Corrected or revised record

ABSTRACT: The authors developed a novel architecture for an oscillatory neural network that consisted of phase-locked loop circuits. The circuit stores and retrieves complex oscillatory patterns as synchronized states with appropriate phase relations between neurons.

DESCRIPTORS: Phase locked loops--Design; Pattern recognition--Neural network models; Synchronism;

1/5/150 (Item 6 from file: 99)
DIALOG(R)File 99:Wilson Appl. Sci & Tech Abs

1810239 H.W. WILSON RECORD NUMBER: BAST99014707
Weakly connected neural networks [book review]
Hoppensteadt, F. C (Frank Charles; Izhikevich, Eugene M; Ermentrout, Bard reviewer
SIAM Review v. 41 no1 (Mar. '99) p. 178-9
DOCUMENT TYPE: Reviews ISSN: 0036-1445 LANGUAGE: Undetermined
RECORD STATUS: New record

1/5/151 (Item 7 from file: 99)
DIALOG(R)File 99:Wilson Appl. Sci & Tech Abs

1235246 H.W. WILSON RECORD NUMBER: BAST95030834
Singular perturbation solutions of noisy systems
Hoppensteadt, Frank C ;
SIAM Journal on Applied Mathematics v. 55 (Apr. '95) p. 544-51
DOCUMENT TYPE: Feature Article ISSN: 0036-1399 LANGUAGE: English
RECORD STATUS: New record

DESCRIPTORS: Singularly perturbed systems; Stochastic processes;

1/5/152 (Item 8 from file: 99)
DIALOG(R)File 99:Wilson Appl. Sci & Tech Abs

1160551 H.W. WILSON RECORD NUMBER: BAST94029136
Mathematics in medicine and the life sciences [book review]
Hoppensteadt, F. C (Frank Charles; Peskin, Charles S; Milton, John
reviewer
SIAM Review v. 36 (Mar. '94) p. 134-5
DOCUMENT TYPE: Reviews ISSN: 0036-1445 LANGUAGE: Undetermined
RECORD STATUS: New record

1/5/153 (Item 9 from file: 99)
DIALOG(R)File 99:Wilson Appl. Sci & Tech Abs

1159390 H.W. WILSON RECORD NUMBER: BAST94027975
A particle method for population waves
Chiu, Chichia; **Hoppensteadt, Frank C**
SIAM Journal on Applied Mathematics v. 54 (Apr. '94) p. 466-77
DOCUMENT TYPE: Feature Article ISSN: 0036-1399 LANGUAGE: English
RECORD STATUS: New record

ABSTRACT: The authors derive a particle technique for solving the weak formulation of a phase model that permits the growth rate of cells to change at different phases of cell cycle. Phase models are useful for analyzing synchronization of bacterial cell culture growth and other biological occurrences associated with cell cycles. Particle techniques are numerical techniques that are especially useful in computational fluid dynamics, where they are sometimes referred to as vortex methods. The particle technique can be a natural way of explaining how synchronized cell cultures can be induced by starvation-nutrition cycles. The convergence of the proposed particle method is proved for the linear version of the model. Error estimates for the approximation are derived.

DESCRIPTORS: Bacteriology--Cultures and culture media; Differential equations--Numerical solutions; Cell division (Biology)--Mathematical models;

1/5/154 (Item 10 from file: 99)
DIALOG(R)File 99:Wilson Appl. Sci & Tech Abs

1055207 H.W. WILSON RECORD NUMBER: BAST92053992
Signal processing by model neural networks
Hoppensteadt, F. C ;
SIAM Review v. 34 (Sept. '92) p. 426-44
DOCUMENT TYPE: Feature Article ISSN: 0036-1445 LANGUAGE: English
RECORD STATUS: New record

DESCRIPTORS: Computational neuroscience; Phase locked loops; Voltage controlled oscillators;

1/5/155 (Item 1 from file: 103)
DIALOG(R)File 103:Energy SciTec

00419768 INS-78-016899; EDB-78-118949
Title: Dynamics of the Josephson junction
Author(s): Levi, M.; **Hoppensteadt, F.C.** ; Miranker, W.L
Affiliation: Courant Institute, New York University
Source: Q. Appl. Math. (United States) v 37:3. Coden: QAMAA
Publication Date: Jul 1978
p 167-198
Document Type: Journal Article
Language: English
Journal Announcement: EDB7810
Subfile: INS (US Atomindex input); AIP (SPIN).
Country of Origin: United States
Abstract: We study the sine-Gordon equation and systems of discrete approximations to it which are respectively a model of the Josephson junction and models of coupled-point Josephson junctions. We do this in the so-called current-driven case. The voltage response of these devices is the average of the time derivative of the solution of these equations and we demonstrate the existence of running periodic solutions for which the average exists. Static solutions are also studied. These together with the running solutions explain the multiple-valuedness in the response of a Josephson junction in several cases. The stability of the various solutions is described in some of the cases. Numerical results are displayed with give details of structure of solution types in the case of a single point junction and of the one-dimensional distributed junction.;
Major Descriptors: *JOSEPHSON JUNCTIONS -- SINE-GORDON EQUATION
Descriptors: BOUNDARY CONDITIONS; COUPLING; ONE-DIMENSIONAL CALCULATIONS
Broader Terms: EQUATIONS; FIELD EQUATIONS; SUPERCONDUCTING JUNCTIONS
Subject Categories: 656101* -- Solid State Physics -- Superconductivity -- General Theory -- (-1987)
INIS Subject Categories: A17* -- Low Temperature Physics

1/5/156 (Item 1 from file: 144)
DIALOG(R)File 144:Pascal

16858785 PASCAL No.: 04-0518926
Oscillatory associative memory network with perfect retrieval
NISHIKAWA Takashi; **HOPPENSTEADT Frank C** ; LAI Ying-Cheng
Department of Mathematics and Center for Systems Science and Engineering Research, Arizona State University, Tempe, Arizona 85287, United States; Courant Institute of Mathematical Sciences, New York University, New York NY 10012, United States; Department of Electrical Engineering, Arizona State University, Tempe, Arizona 85287, United States
Journal: Physica. D, 2004, 197 (1-2) 134-148
ISSN: 0167-2789 CODEN: PDNPDT Availability: INIST-145D; 354000120345920080
No. of Refs.: 22 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: Netherlands
Language: English
Inspired by the discovery of possible roles of synchronization of oscillations in the brain, networks of coupled phase oscillators have been proposed before as models of associative memory based on the concept of temporal coding of information. Here we show, however, that error-free retrieval states of such networks turn out to be typically unstable regardless of the network size, in contrast to the classical Hopfield model. We propose a remedy for this undesirable property, and provide a systematic study of the improved model. In particular, we show that the error-free capacity of the network is at least 2 epsilon SUP 2 / log n patterns per neuron, where n is the number of oscillators (neurons) and

epsilon the strength of the second-order mode in the coupling function.

English Descriptors: Synchronization; Coupled oscillator; Hopfield model; Second order; Mode coupling; Neural networks; Random matrix; Non linear phenomenon

French Descriptors: Synchronisation; Oscillateur couple; Modele Hopfield; Ordre 2; Couplage mode; Reseau neuronal; Matrice aleatoire; Phenomene non lineaire

Classification Codes: 001B

1/5/157 (Item 2 from file: 144)
DIALOG(R)File 144:Pascal

16625961 PASCAL No.: 04-0276258

Bursts as a unit of neural information: selective communication via resonance

IZHIKEVICH Eugene M ; DESAI Niraj S; WALCOTT Elisabeth C; **HOPPENSTEADT Frank C**
The Neurosciences Institute, 10640 John Jay Hopkins Drive, San Diego, CA 92121, United States; Center for Systems Science, Arizona State University, Tempe, AZ 85287, United States
Journal: Trends in neurosciences : (Regular edition), 2003, 26 (3) 161-167
ISSN: 0166-2236 Availability: INIST-18018B; 354000114892680100
No. of Refs.: 38 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United Kingdom
Language: English
What is the functional significance of generating a burst of spikes, as opposed to a single spike? A dominant point of view is that bursts are needed to increase the reliability of communication between neurons. Here, we discuss the alternative, but complementary, hypothesis: bursts with specific resonant interspike frequencies are more likely to cause a postsynaptic cell to fire than are bursts with higher or lower frequencies. Such a frequency preference might occur at the level of individual synapses because of the interplay between short-term synaptic depression and facilitation, or at the postsynaptic cell level because of subthreshold membrane potential oscillations and resonance. As a result, the same burst could resonate for some synapses or cells and not resonate for others, depending on their natural resonance frequencies. This observation suggests that, in addition to increasing reliability of synaptic transmission, bursts of action potentials might provide effective mechanisms for selective communication between neurons.

English Descriptors: Review; Neuron; Discharge pattern; Resonance; Communication; Synapse; Synaptic plasticity; Facilitation; Membrane potential; Oscillation; Resonance frequency; Synaptic transmission; Synaptic potential; Action potential
Broad Descriptors: Electrophysiology; Electrophysiologie; Electrofisiologia

French Descriptors: Article synthese; Neurone; Mode decharge; Resonance; Communication; Synapse; Plasticite synaptique; Facilitation; Potentiel membrane; Oscillation; Frequence resonance; Transmission synaptique; Potentiel synaptique; Potentiel action

Classification Codes: 002A25D03

1/5/158 (Item 3 from file: 144)
DIALOG(R)File 144:Pascal

16489216 PASCAL No.: 04-0133499

Capacity of Oscillatory Associative-Memory Networks with Error-Free Retrieval

NISHIKAWA Takashi; LAI Ying-Cheng; **HOPPENSTEADT Frank C**
Department of Mathematics, Center for Systems Science and Engineering Research, Arizona State University, Tempe, Arizona 85287, USA; Department of Electrical Engineering, Arizona State University, Tempe, Arizona 85287, USA

Journal: Physical review letters, 2004-03-12, 92 (10) 108101-108101-4
ISSN: 0031-9007 CODEN: PRLTAO Availability: INIST-8895
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United States
Language: English

Networks of coupled periodic oscillators (similar to the Kuramoto model) have been proposed as models of associative memory. However, error-free retrieval states of such oscillatory networks are typically unstable, resulting in a near zero capacity. This puts the networks at disadvantage as compared with the classical Hopfield network. Here we propose a simple remedy for this undesirable property and show rigorously that the error-free capacity of our oscillatory, associative-memory networks can be made as high as that of the Hopfield network. They can thus not only provide insights into the origin of biological memory, but can also be potentially useful for applications in information science and engineering.

English Descriptors: Theoretical study; Neurophysiology; Hopfield neural nets; Brain models; Asymptotic stability; Patterning

French Descriptors: 8719L; 8435; 8920F; 8970; Etude theorique; Neurophysiologie; Reseau neuronal Hopfield; Modele encephale; Stabilite asymptotique; Formation motif

Classification Codes: 002A25A; 001D03G03; 001D02A01; 001A01A; 205

1/5/159 (Item 4 from file: 144)
DIALOG(R)File 144:Pascal

16444916 PASCAL No.: 04-0087024

Slowly coupled oscillators: Phase dynamics and synchronization

IZHIKEVICH E M ; HOPPENSTEADT F C
The Neurosciences Institute, San Diego, CA 92121, United States

Journal: SIAM Journal on Applied Mathematics, 2003, 63 (6) 1935-1953
ISSN: 0036-1399 CODEN: SMJMAP Availability: INIST-4588
No. of Refs.: 15 Refs.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United States
Language: English

In this paper we extend the results of Frankel and Kiemel Degree SIAM J. Appl. Math, 53 (1993), pp. 1436-1446<pilcrow> to a network of slowly coupled oscillators. First, we use Malkin's theorem to derive a canonical phase model that describes synchronization properties of a slowly coupled network. Then, we illustrate the result using slowly coupled oscillators (1) near Andronov-Hopf bifurcations, (2) near saddle-node on invariant circle bifurcations, and (3) near relaxation oscillations. We compare and contrast synchronization properties of slowly and weakly coupled oscillators.

English Descriptors: Coupled oscillators; Phase dynamics; Phase model; Saddle node on invariant circle; Excitability; Malkin theorem; MATLAB;

Application; Relaxation oscillators; Coupled circuits; Synchronization; Bifurcation (mathematics); Vectors; Asymptotic stability; Integral equations; Matrix algebra; Computer simulation; Mathematical models; Theory; Experiments

French Descriptors: Application; Oscillateur relaxation; Circuit couple; Synchronisation; Bifurcation(mathematiques); Vecteur; Stabilite asymptotique; Equation integrale; Algebre matricielle; Simulation ordinateur; Modele mathematique; Theorie; Experience

Classification Codes: 001A02I01; 001D03G02A1; 001D02D; 001A02D; 001A02E; 001D02B12

1/5/160 (Item 5 from file: 144)
DIALOG(R)File 144:Pascal

16442125 PASCAL No.: 04-0084233
Simple model of spiking neurons
IZHIKEVICH E M
The Neurosciences Institute, San Diego, CA 92121, United States
Journal: IEEE Transactions on Neural Networks, 2003, 14 (6) 1569-1572
ISSN: 1045-9227 CODEN: ITNNEP Availability: INIST-22204
No. of Refs.: 10 Refs.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United States
Language: English
A model is presented that reproduces spiking and bursting behavior of known types of cortical neurons. The model combines the biologically plausibility of Hodgkin-Huxley-type dynamics and the computational efficiency of integrate-and-fire neurons. Using this model, one can simulate tens of thousands of spiking cortical neurons in real time (1 ms resolution) using a desktop PC.

English Descriptors: Spiking neurons; Hodgkin-Huxley model; Cortical neurons; Theory; Mathematical models; Computational methods; Computer simulation; Personal computers; Brain models; Ordinary differential equations; Bifurcation (mathematics); Neural networks
French Descriptors: Theorie; Modele mathematique; Methode calcul; Simulation ordinateur; Ordinateur personnel; Modele encephale; Equation differentielle ordinaire; Bifurcation(mathematiques); Reseau neuronal

Classification Codes: 001D02C; 001A02I01; 001D02B12; 001D03J07; 001A02E

1/5/161 (Item 6 from file: 144)
DIALOG(R)File 144:Pascal

16259041 PASCAL No.: 03-0421230
Relating STDP to BCM
IZHIKEVICH Eugene M ; DESAI Niraj S
The Neurosciences Institute, San Diego, CA, 92121, United States
Journal: Neural computation, 2003, 15 (7) 1511-1523
ISSN: 0899-7667 Availability: INIST-22595; 354000118255110040
No. of Refs.: 19 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United States
Language: English
We demonstrate that the BCM learning rule follows directly from STDP when pre- and postsynaptic neurons fire uncorrelated or weakly correlated Poisson spike trains, and only nearest-neighbor spike interactions are taken into account.

English Descriptors: Neural network; Learning; Synaptic plasticity; Presynaptic neuron; Postsynaptic neuron; Poisson process; Nearest neighbour; Neural computation; Spike timing dependent plasticity

French Descriptors: Reseau neuronal; Apprentissage; Plasticite synaptique; Neurone presynaptique; Neurone postsynaptique; Processus Poisson; Plus proche voisin; Calcul neuronal; Plasticite hebbienne

Classification Codes: 002A01B; 002A25A; 001D02C02

1/5/162 (Item 7 from file: 144)
DIALOG(R)File 144:Pascal

16161146 PASCAL No.: 03-0316743

Heterogeneity in Oscillator Networks: Are Smaller Worlds Easier to Synchronize?

NISHIKAWA Takashi; MOTTER Adilson E; LAI Ying-Cheng; **HOPPENSTEADT Frank C**

Department of Mathematics, Arizona State University, Tempe, Arizona 85287, USA; Department of Electrical Engineering, Arizona State University, Tempe, Arizona 85287, USA

Journal: Physical review letters, 2003-07-04, 91 (1) 014101-014101-4
ISSN: 0031-9007 CODEN: PRLTAO Availability: INIST-8895
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United States
Language: English

Small-world and scale-free networks are known to be more easily synchronized than regular lattices, which is usually attributed to the smaller network distance between oscillators. Surprisingly, we find that networks with a homogeneous distribution of connectivity are more synchronizable than heterogeneous ones, even though the average network distance is larger. We present numerical computations and analytical estimates on synchronizability of the network in terms of its heterogeneity parameters. Our results suggest that some degree of homogeneity is expected in naturally evolved structures, such as neural networks, where synchronizability is desirable.

English Descriptors: Theoretical study; Computerized simulation; Oscillators; Synchronization; Neural networks; Network topology

French Descriptors: 0545X; 8718S; 8975; Etude theorique; Simulation ordinateur; Oscillateur; Synchronisation; Reseau neuronal; Topologie circuit

Classification Codes: 001B00E45X; 002A04H18; 001B00E45

1/5/163 (Item 8 from file: 144)
DIALOG(R)File 144:Pascal

15978542 PASCAL No.: 03-0123062

Numerical and experimental investigation of the effect of filtering on chaotic symbolic dynamics

ZHU Liqiang; LAI Ying-Cheng; **HOPPENSTEADT Frank C** ; BOLLT Erik M

Department of Electrical Engineering, Center for Systems Science and Engineering Research, Arizona State University, Tempe, Arizona 85287; Department of Electrical Engineering, Center for Systems Science and Engineering Research, Arizona State University, Tempe, Arizona 85287;

Department of Mathematics, Arizona State University, Tempe, Arizona 85287; Department of Mathematics and Computer Science, Clarkson University, Potsdam, New York 13699
Journal: Chaos, 2003-03, 13 (1) 410-419
ISSN: 1054-1500 CODEN: CHAOEH Availability: INIST-22772
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United States
Language: English
Motivated by the practical consideration of the measurement of chaotic signals in experiments or the transmission of these signals through a physical medium, we investigate the effect of filtering on chaotic symbolic dynamics. We focus on the linear, time-invariant filters that are used frequently in many applications, and on the two quantities characterizing chaotic symbolic dynamics: topological entropy and bit-error rate. Theoretical consideration suggests that the topological entropy is invariant under filtering. Since computation of this entropy requires that the generating partition for defining the symbolic dynamics be known, in practical situations the computed entropy may change as a filtering parameter is changed. We find, through numerical computations and experiments with a chaotic electronic circuit, that with reasonable care the computed or measured entropy values can be preserved for a wide range of the filtering parameter. (c) 2003 American Institute of Physics.

English Descriptors: Experimental study; Computerized simulation; Entropy; Chaos; Nonlinear network analysis; Nonlinear filters

French Descriptors: 0545P; Etude experimentale; Simulation ordinateur; Entropie; Chaos; Analyse reseau non lineaire; Filtre non lineaire

Classification Codes: 001B00E45A

1/5/164 (Item 9 from file: 144)
DIALOG(R)File 144:Pascal

15833870 PASCAL No.: 02-0552199
Smallest small-world network
NISHIKAWA Takashi; MOTTER Adilson E; LAI Ying-Cheng; **HOPPENSTEADT Frank C**
Department of Mathematics, Center for Systems Science and Engineering Research, Arizona State University, Tempe, Arizona 85287; Department of Electrical Engineering, Arizona State University, Tempe, Arizona 85287
Journal: Physical review. E, Statistical, nonlinear and soft matter physics, 2002-10, 66 (4) 046139-046139-5
ISSN: 1063-651X CODEN: PLEEE8 Availability: INIST-144 E
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United States
Language: English
Efficiency in passage times is an important issue in designing networks, such as transportation or computer networks. The small-world networks have structures that yield high efficiency, while keeping the network highly clustered. We show that among all networks with the small-world structure, the most efficient ones have a single center node, from which all shortcuts are connected to uniformly distributed nodes over the network. The networks with several centers and a connected subnetwork of shortcuts are shown to be almost as efficient. Genetic-algorithm simulations further support our results.

English Descriptors: Theoretical study; Computerized simulation; Transportation; Computer networks; Genetic algorithms; Neural networks; Simulation

French Descriptors: 8975H; 4510D; 8920H; Etude theorique; Simulation

ordinateur; Transports; Reseau ordinateur; Algorithme genetique; Reseau neuronal; Simulation

Classification Codes: 001B00B10; 001B40F10; 001D04B03

1/5/165 (Item 10 from file: 144)
DIALOG(R)File 144:Pascal

15429842 PASCAL No.: 02-0121691
Neural computations by networks of oscillators
IJCNN 2000 : international joint conference on neural networks : neural computing : new challenges and perspectives for the new millennium : Como, 24-27 July 2000
HOPPENSTEADT Frank ; IZHIKEVICH Eugene
AMARI Shun-Ichi, ed; GILES C Lee, ed; GORI Marco, ed; PIURI Vincenzo, ed
System Science and Engineering Research Center, Arizona State University, Tempe AZ 85287-7606, United States
IEEE-INNS-ENNS international joint conference on neural networks (Como ITA) 2000-07-24
2000 Vol4.41-44
Publisher: IEEE Computer Society, Los Alamitos CA
ISBN: 0-7695-0619-4 Availability: INIST-Y 33704; 354000097049262190
No. of Refs.: 4 ref.
Document Type: C (Conference Proceedings) ; A (Analytic)
Country of Publication: United States
Language: English
We describe here how a network of oscillators can perform neural computations. In particular, it shown how the connectivity within the network can be created to memorize data in terms of phase relations between synchronized states. The memorized states are extracted through correlation calculations. The influence of noise on the system is discussed.

English Descriptors: Artificial intelligence; Neural network; Signal to noise ratio; Coupled oscillator; Modeling

French Descriptors: Intelligence artificielle; Reseau neuronal; Rapport signal bruit; Oscillateur couple; Modelisation

Classification Codes: 001D02C06

1/5/166 (Item 11 from file: 144)
DIALOG(R)File 144:Pascal

15309922 PASCAL No.: 01-0484083
Resonate-and-fire neurons
Spiking neurons in neuroscience and technology
IZHIKEVICH Eugene M
GROSSBERG Stephen, ed; MAASS Wolfgang, ed; MARKRAM Henry, ed
The Neurosciences Institute, 10640 John Jay Hopkins Drive, San Diego, CA 92121, United States
Boston University, United States; Technische Universitaet Graz, Austria; Weizmann Institute, Israel
Journal: Neural networks, 2001, 14 (6-7) 883-894
ISSN: 0893-6080 Availability: INIST-21689; 354000096412190250
No. of Refs.: 27 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United Kingdom

Language: English

We suggest a simple spiking model-resonate-and-fire neuron, which is similar to the integrate-and-fire neuron except that the state variable is complex. The model provides geometric illustrations to many interesting phenomena occurring in biological neurons having subthreshold damped oscillations of membrane potential. For example, such neurons prefer a certain resonant frequency of the input that is nearly equal to their eigenfrequency, they can be excited or inhibited by a doublet (two pulses) depending on its interspike interval, and they can fire in response to an inhibitory input. All these properties could be observed in Hodgkin-Huxley-type models. We use the resonate-and-fire model to illustrate possible sensitivity of biological neurons to the fine temporal structure of the input spike train. Being an analogue of the integrate-and-fire model, the resonate-and-fire model is computationally efficient and suitable for simulations of large networks of spiking neurons.

English Descriptors: Neural network; Spike potential; Complex variable method

French Descriptors: Reseau neuronal; Potentiel pointe; Methode variable complexe

Classification Codes: 001D02C06

1/5/167 (Item 12 from file: 144)
DIALOG(R)File 144:Pascal

15201746 PASCAL No.: 01-0367234

Synchronization of elliptic bursters

IZHIKEVICH Eugene M

The Neurosciences Institute, 10640 John Jay Hopkins Drive, San Diego, CA 92121, United States

Journal: SIAM review : (Print), 2001, 43 (2) 315-344

ISSN: 0036-1445 CODEN: SIREAD Availability: INIST-9152; 354000098351420040

No. of Refs.: 1 p.1/4

Document Type: P (Serial) ; A (Analytic)

Country of Publication: United States

Language: English

Periodic bursting behavior in neurons is a recurrent transition between a quiescent state and repetitive spiking When the transition to repetitive spiking occurs via a subcritical Andronov-Hopf bifurcation and the transition to the quiescent state occurs via fold limit cycle bifurcation, the burster is said to be of elliptic type (also known as a "subHopf/fold cycle" burster). Here we study the synchronization dynamics of weakly connected networks of such bursters. We find that the behavior of such networks is quite different from the behavior of weakly connected phase oscillators and resembles that of strongly connected relaxation oscillators. As a result, such weakly connected bursters need few (usually one) bursts to synchronize, and synchronization is possible for bursters having quite different quantitative features. We also find that interactions between bursters depend crucially on the spiking frequencies, Namely the interactions are most effective when the presynaptic interspike frequency matches the frequency of postsynaptic oscillations. Finally, we use the FitzHugh-Rinzel, Morris-Lecar, and Hodgkin-Huxley models to illustrate our major results.

English Descriptors: Differential equation; Elliptic equation; Normal form; Threshold; Modulation; Simulation; Neuron; Passage; Bifurcation; Spike; Synchronization; Periodic behavior; Behavior; Transition; Hopf bifurcation; Limit cycle; Network; Phase; Oscillator; Relaxation;

Oscillation frequency; Oscillation

French Descriptors: Equation differentielle; Equation elliptique; Forme normale; Seuil; Modulation; Simulation; Neurone; Passage; Bifurcation; Pointe positive; Synchronisation; Regime periodique; Comportement; Transition; Bifurcation Hopf; Cycle limite; Reseau; Phase; Oscillateur; Relaxation; Frequence oscillation; Oscillation

Classification Codes: 002A01B; 002A25A; 001B00E50; 001A02G04

1/5/168 (Item 13 from file: 144)
DIALOG(R)File 144:Pascal

15033882 PASCAL No.: 01-0190971
Phase clustering and transition to phase synchronization in a large number of coupled nonlinear oscillators
LIU Zonghua; LAI Ying-Cheng; **HOPPENSTEADT Frank C**
Department of Mathematics, Arizona State University, Tempe, Arizona 85287 ; Department of Electrical Engineering, Center for Systems Science and Engineering Research, Arizona State University, Tempe, Arizona 85287; Department of Physics and Astronomy, Arizona State University, Tempe, Arizona 85287
Journal: Physical review. E, Statistical physics, plasmas, fluids, and related interdisciplinary topics, 2001-05, 63 (5) 055201-055201-4
ISSN: 1063-651X CODEN: PLEEE8 Availability: INIST-144 E
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United States
Language: English
The transition to phase synchronization in systems consisting of a large number (N) of coupled nonlinear oscillators via the route of phase clustering (phase synchronization among subsets of oscillators) is investigated. We elucidate the mechanism for the merger of phase clusters and find an algebraic scaling between the critical coupling parameter required for phase synchronization and N. Our result implies that, in realistic situations, phase clustering may be more prevalent than full phase synchronization.

English Descriptors: Theoretical study; Computerized simulation; Chaos; Synchronization

French Descriptors: 0545X; 0540; Etude theorique; Simulation ordinateur; Chaos; Synchronisation

Classification Codes: 001B00E45X; 001B00E40

1/5/169 (Item 14 from file: 144)
DIALOG(R)File 144:Pascal

15001398 PASCAL No.: 01-0156836
Synchronization of MEMS resonators and mechanical neurocomputing
HOPPENSTEADT F C ; IZHIKEVICH E M
Arizona State Univ, Tempe AZ, United States
Journal: IEEE Transactions on Circuits and Systems I: Fundamental Theory and Applications, 2001, 48 (2) 133-138
ISSN: 1057-7122 Availability: INIST-222 E81
No. of Refs.: 19 Refs.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United States

Language: English

We combine here two well-known and established concepts: microelectromechanical systems (MEMS) and neurocomputing. First, we consider MEMS oscillators having low amplitude activity and we derive a simple mathematical model that describes nonlinear phase-locking dynamics in them. Then, we investigate a theoretical possibility of using MEMS oscillators to build an oscillatory neurocomputer having autocorrelative associative memory. The neurocomputer stores and retrieves complex oscillatory patterns in the form of synchronized states with appropriate phase relations between the oscillators. Thus, we show that MEMS alone can be used to build a sophisticated information processing system (U.S. provisional patent 60/178,654).

English Descriptors: Mechanical neurocomputing; Nonlinear phase-locking; Oscillatory patterns; Theory; Synchronization; Resonators; Neural networks; Associative storage; Mathematical models; Bifurcation (mathematics); Microelectromechanical devices

French Descriptors: Theorie; Synchronisation; Resonateur; Reseau neuronal; Memoire associative; Modele mathematique; Bifurcation(mathematiques); Dispositif microelectromecanique

Classification Codes: 001D05G; 001D12E05; 001D02D; 001D02C; 001D03I02; 001A02

1/5/170 (Item 15 from file: 144)
DIALOG(R)File 144:Pascal

14833504 PASCAL No.: 00-0516955
Phase equations for relaxation oscillators
IZHIKEVICH E M
Arizona State Univ, Tempe AZ, United States
Journal: SIAM Journal on Applied Mathematics, 2000, 60 (5) 1789-1804
ISSN: 0036-1399 CODEN: SMJMAP Availability: INIST-4588
No. of Refs.: 24 Refs.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United States
Language: English

We use the Malkin theorem to derive phase equations for networks of weakly connected relaxation oscillators. We find an explicit formula for the connection functions when the oscillators have one-dimensional slow variables. The functions are discontinuous in the relaxation limit mu rightarrow 0, which provides a simple alternative illustration to the major conclusion of the fast threshold modulation (FTM) theory by Somers and Kopell that synchronization of relaxation oscillators has properties that are quite different from those of smooth (nonrelaxation) oscillators. We use Bonhoeffer-Van Der Pol relaxation oscillators to illustrate the theory numerically.

English Descriptors: Fast threshold modulation (FTM) theory; Malkin theorem ; Bonhoeffer-Van Der Pol relaxation oscillators; Theory; Pattern recognition; Linear equations; Numerical analysis; Synchronization; Relaxation oscillators

French Descriptors: Theorie; Reconnaissance forme; Equation lineaire; Analyse numerique; Synchronisation; Oscillateur relaxation

Classification Codes: 001D03G02A1; 001D04B; 001A02; 001A02I01

1/5/171 (Item 16 from file: 144)
DIALOG(R)File 144:Pascal

14726770 PASCAL No.: 00-0403135

Synchronization of laser oscillators, associative memory, and optical neurocomputing

HOPPENSTEADT Frank C ; IZHIKEVICH Eugene M

Center for Systems Science and Engineering, Arizona State University, Tempe, Arizona 85287-7606

Journal: Physical review. E, Statistical physics, plasmas, fluids, and related interdisciplinary topics, 2000-09, 62 (3) 4010-4013

ISSN: 1063-651X CODEN: PLEEE8 Availability: INIST-144 E

Document Type: P (Serial) ; A (Analytic)

Country of Publication: United States

Language: English

We investigate here possible neurocomputational features of networks of laser oscillators. Our approach is similar to classical optical neurocomputing where artificial neurons are lasers and connection matrices are holographic media. However, we consider oscillatory neurons communicating via phases rather than amplitudes. Memorized patterns correspond to synchronized states where the neurons oscillate with equal frequencies and with prescribed phase relations. The mechanism of recognition is related to phase locking.

English Descriptors: Theoretical study; Computerized simulation; Optical neural nets; Synchronization; Associative processing; Laser beam applications; Content-addressable storage

French Descriptors: 8718S; 4265; 0545; 0705; Etude theorique; Simulation ordinateur; Reseau neuronal optique; Synchronisation; Traitement associatif; Application laser; Memoire associative

Classification Codes: 002A04H18; 001B40B65; 001B00E45; 001B00G05

1/5/172 (Item 17 from file: 144)

DIALOG(R)File 144:Pascal

14702509 PASCAL No.: 00-0377878

Pattern recognition via synchronization in phase-locked loop neural networks

HOPPENSTEADT F C ; IZHIKEVICH E M

Arizona State Univ, Tempe AZ, United States

Journal: IEEE Transactions on Neural Networks, 2000, 11 (3) 734-738

ISSN: 1045-9227 Availability: INIST-22204

No. of Refs.: 15 Refs.

Document Type: P (Serial) ; A (Analytic)

Country of Publication: United States

Language: English

We propose a novel architecture of an oscillatory neural network that consists of phase-locked loop (PLL) circuits. It stores and retrieves complex oscillatory patterns as synchronized states with appropriate phase relations between neurons.

English Descriptors: Phase locked loop neural networks; Brain rhythms; Oscillatory associative memory; Application; Phase locked loops; Variable frequency oscillators; Pattern recognition; Synchronization; Phase shifters; Natural frequencies; Neural networks; Experiments

French Descriptors: Application; Boucle verrouillage phase; Oscillateur commande tension; Reconnaissance forme; Synchronisation; Dephaseur; Frequence propre; Reseau neuronal; Experience

Classification Codes: 001D02C; 001D03G02A; 001D03G02A1; 001D02B12

1/5/173 (Item 18 from file: 144)

14591712 PASCAL No.: 00-0259463

Subcritical elliptic bursting of Bautin type

IZHIKEVICH E M
Arizona State Univ, Tempe AZ, United States

Journal: SIAM Journal on Applied Mathematics, 2000, 60 (2) 503-535
ISSN: 0036-1399 CODEN: SMJMAP Availability: INIST-4588
No. of Refs.: 40 Refs.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United States
Language: English

Bursting behavior in neurons is a recurrent transition between a quiescent state and repetitive spiking. When the transition to repetitive spiking occurs via a subcritical Andronov-Hopf bifurcation and the transition to the quiescent state occurs via double limit cycle bifurcation, the burster is said to be of subcritical elliptic type. When the fast subsystem is near a Bautin (generalized Hopf) point, both bifurcations occur for nearby values of the slow variable, and the repetitive spiking has small amplitude. We refer to such an elliptic burster as being of local Bautin type. First, we prove that any such burster can be converted into a canonical model by a suitable continuous (possibly noninvertible) change of variables. We also derive a canonical model for weakly connected networks of such bursters. We find that behavior of such networks is quite different from the behavior of weakly connected phase oscillators, and it resembles that of strongly connected relaxation oscillators. As a result, such weakly connected bursters need few (usually one) bursts to synchronize. In-phase synchronization is possible for bursters having quite different quantitative features, whereas out-of-phase synchronization may be difficult to achieve. We also find that interactions between bursters depend crucially on the spiking frequencies. Namely, the interactions are most effective when the presynaptic interspike frequency matches the frequency of postsynaptic oscillations. Finally, we use the FitzHugh-Rinzel model to evaluate how studying local Bautin bursters can contribute to our understanding of the phenomena of subcritical elliptic bursting.

English Descriptors: Subcritical elliptic burster; Subcritical Andronov Hopf bifurcations; Bautin bifurcation; Double limit cycle bifurcation; Canonical model; Fast threshold modulation; Application; Mathematical models; Telecommunication networks; Perturbation techniques; Vectors; Integral equations; Spurious signal noise; Differential equations; Mathematical transformations; Theorem proving; Bifurcation (mathematics); Theory
French Descriptors: Application; Modele mathematique; Reseau telecommunication; Technique perturbation; Vecteur; Equation integrale; Bruit parasite signal; Equation differentielle; Transformation mathematique; Demonstration theoreme; Bifurcation(mathematiques); Theorie

Classification Codes: 001A02I01; 001D04A; 001A02D; 001A02E

1/5/174 (Item 19 from file: 144)

14564845 PASCAL No.: 00-0231339

Weakly connected quasi-periodic oscillators, FM interactions, and multiplexing in the brain

IZHIKEVICH E M
Arizona State Univ, Tempe AZ, United States

Journal: SIAM Journal on Applied Mathematics, 1999, 59 (6) 2193-2223
ISSN: 0036-1399 CODEN: SMJMAP Availability: INIST-4588
No. of Refs.: 48 Refs.
Document Type: P (Serial) ; A (Analytic)

Country of Publication: United States
Language: English
We prove that weakly connected networks of quasi-periodic (multifrequency) oscillators can be transformed into a phase model by a continuous change of variables. The phase model has the same form as the one for periodic oscillators with the exception that each phase variable is a vector. When the oscillators have mutually nonresonant frequency (rotation) vectors, the phase model uncouples. This implies that such oscillators do not interact even though there might be physical connections between them. When the frequency vectors have mutual low-order resonances, the oscillators interact via phase deviations. This mechanism resembles that of the FM radio, with a shared feature - multiplexing of signals. Possible applications to neuroscience are discussed.

English Descriptors: Quasi-periodic oscillators; Theory; Frequency modulation; Mathematical models; Vectors; Oscillators (electronic)

French Descriptors: Theorie; Modulation frequence; Modele mathematique; Vecteur; Oscillateur electronique

Classification Codes: 001D03G02A1; 001A02; 001A02D

1/5/175 (Item 20 from file: 144)
DIALOG(R)File 144:Pascal

14077104 PASCAL No.: 99-0269780
Weakly pulse-coupled oscillators, FM interactions, synchronization, and oscillatory associative memory : Special issue on pulse coupled neural networks
IZHIKEVICH E M
Center for Systems Science and Engineering, Arizona State University, Tempe, AZ 85287-7606, United States
Journal: IEEE transactions on neural networks, 1999, 10 (3) 508-526
ISSN: 1045-9227 Availability: INIST-22204; 354000084197240050
No. of Refs.: 34 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United States
Language: English
We study pulse-coupled neural networks that satisfy only two assumptions: each isolated neuron fires periodically, and the neurons are weakly connected. Each such network can be transformed by a piece-wise continuous change of variables into a phase model, whose synchronization behavior and oscillatory associative properties are easier to analyze and understand. Using the phase model, we can predict whether a given pulse-coupled network has oscillatory associative memory, or what minimal adjustments should be made so that it can acquire memory. In the search for such minimal adjustments we obtain a large class of simple pulse-coupled neural networks that can memorize and reproduce synchronized temporal patterns the same way a Hopfield network does with static patterns. The learning occurs via modification of synaptic weights and/or synaptic transmission delays.

English Descriptors: Neural network; Associative memory; Synchronization; Canonical analysis; Multiplexing; Hopfield model

French Descriptors: Reseau neuronal; Memoire associative; Synchronisation; Analyse canonique; Multiplexage; Modele Hopfield; Modele phase

Classification Codes: 001D03G03

1/5/176 (Item 21 from file: 144)

14077103 PASCAL No.: 99-0269779

Class 1 neural excitability, conventional synapses, weakly connected networks, and mathematical foundations of pulse-coupled models : Special issue on pulse coupled neural networks

IZHIKEVICH E M
Center for Systems Science and Engineering, Arizona State University, Tempe, AZ 85287-7606, United States

Journal: IEEE transactions on neural networks, 1999, 10 (3) 499-507
ISSN: 1045-9227 Availability: INIST-22204; 354000084197240040
No. of Refs.: 12 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United States
Language: English

Many scientists believe that all pulse-coupled neural networks are toy models that are far away from the biological reality. We show here, however, that a huge class of biophysically detailed and biologically plausible neural-network models can be transformed into a canonical pulse-coupled form by a piece-wise continuous, possibly noninvertible, change of variables. Such transformations exist when a network satisfies a number of conditions; e.g., it is weakly connected; the neurons are Class 1 excitable (i.e., they can generate action potentials with an arbitrary small frequency); and the synapses between neurons are conventional (i.e., axo-dendritic and axo-somatic). Thus, the difference between studying the pulse-coupled model and Hodgkin-Huxley-type neural networks is just a matter of a coordinate change. Therefore, any piece of information about the pulse-coupled model is valuable since it tells something about all weakly connected networks of Class 1 neurons. For example, we show that the pulse-coupled network of identical neurons does not synchronize in-phase. This confirms Ermentrout's result that weakly connected Class 1 neurons are difficult to synchronize, regardless of the equations that describe dynamics of each cell.

English Descriptors: Neural network; Synapse; Desynchronization; Biophysics ; Axodendritic synapse; Axosomatic synapse; Canonical model; Hodgkin neural network

French Descriptors: Reseau neuronal; Synapse; Desynchronisation; Biophysique; Synapse axodendritique; Synapse axosomatique; Classe 1; Modele phase; Modele canonique; Reseau neuronal Hodgkin

Classification Codes: 001D03G03

1/5/177 (Item 22 from file: 144)

13989719 PASCAL No.: 99-0174029

Oscillatory Neurocomputers with Dynamic Connectivity

HOPPENSTEADT Frank C ; IZHIKEVICH Eugene M
Center for Systems Science & Engineering, Arizona State University, Tempe, Arizona 85287-7606

Journal: Physical review letters, 1999-04-05, 82 (14) 2983-2986
ISSN: 0031-9007 CODEN: PRLTAO Availability: INIST-8895
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United States
Language: English

Our study of thalamo-cortical systems suggests a new architecture for a neurocomputer that consists of oscillators having different frequencies and that are connected weakly via a common medium forced by an external input. Even though such oscillators are all interconnected homogeneously, the external input imposes a dynamic connectivity. We use Kuramoto<right single

quotation mark>s model to illustrate the idea and to prove that such a neurocomputer has oscillatory associative properties. Then we discuss a general case. The advantage of such a neurocomputer is that it can be built using voltage controlled oscillators, optical oscillators, lasers, microelectromechanical systems, Josephson junctions, macromolecules, or oscillators of other kinds. (Provisional patent 60/108,353)
English Descriptors: Instrumentation; Theoretical study; Brain; Biocomputers; Neurophysiology; Oscillators; Neural networks

French Descriptors: 8710; 0545; 0705M; 4279T; Appareillage; Etude theorique ; Encephale; Bioordinateur; Neurophysiologie; Oscillateur; Reseau neuronal

Classification Codes: 002A01C; 001B00E45; 001B00G05M; 001B40B79T

1/5/178 (Item 23 from file: 144)
DIALOG(R)File 144:Pascal

13728744 PASCAL No.: 98-0420433
Multiple cusp bifurcations
IZHIKEVICH E M
Center for Systems Science and Engineering, Arizona State University, Tempe, AZ 85287-7606, United States
Journal: Neural networks, 1998, 11 (3) 495-508
ISSN: 0893-6080 Availability: INIST-21689; 354000072268800100
No. of Refs.: 30 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United Kingdom
Language: English
The cusp bifurcation provides one of the simplest routes leading to bistability and hysteresis in neuron dynamics. We show that weakly connected networks of neurons near cusp bifurcations that satisfy a certain adaptation condition have quite interesting and complicated dynamics. First, we prove that any such network can be transformed into a canonical model by an appropriate continuous change of variables. Then we show that the canonical model can operate as a multiple attractor neural network or as a globally asymptotically stable neural network depending on the choice of parameters.
English Descriptors: Neural network; Connectionism; Multiple system; Cusp configuration; Bifurcation; Pitching; Canonical ensemble; Learning; Bistability; Perception; Theoretical study

French Descriptors: Reseau neuronal; Connexionnisme; Systeme multiple; Configuration cuspidee; Bifurcation; Tangage; Ensemble canonique; Apprentissage; Bistabilite; Perception; Etude theorique

Classification Codes: 001D02C06; 001D02C02

1/5/179 (Item 24 from file: 144)
DIALOG(R)File 144:Pascal

13621593 PASCAL No.: 98-0327605
Phase models with explicit time delays
IZHIKEVICH Eugene M
Center for Systems Science & Engineering, Arizona State University, Tempe, Arizona 85287-7606
Journal: Physical review. E, Statistical physics, plasmas, fluids, and

related interdisciplinary topics, 1998-07, 58 (1) 905-908
ISSN: 1063-651X CODEN: PLEEE8 Availability: INIST-144 E
Document Type: P (Serial) ; A (Analytic)
Country of Publication: United States
Language: English

Studying weakly connected oscillators leads to phase models. It has been proven recently that weakly connected oscillators with delayed interactions do not lead to phase models with time delays even when the delay is of the same order of magnitude as the period of oscillation. This has resulted in a fading interest in such models. We prove here that if the interaction delay between weakly connected oscillators is much longer than the period of oscillation, then the corresponding phase model does have an explicit time delay.

English Descriptors: Theoretical study; Oscillations; Nonlinear dynamical systems

French Descriptors: 8710; 0545; 0705M; 4279T; Etude theorique; Oscillation; Systeme dynamique non lineaire

Classification Codes: 002A03A; 001B00E45; 001B00G05M; 001B40B79T

1/5/180 (Item 25 from file: 144)
DIALOG(R)File 144:Pascal

12520919 PASCAL No.: 96-0194943
An averaging principle for dynamical systems in Hilbert space with Markov random perturbations
HOPPENSTEADT F ; SALEHI H; SKOROKHOD A
Department of Statistics and Probability, Michigan State University, East Lansing, MI 48824, United States; Institute of Mathematics, Ukrainian Academy of Sciences, Kiev, Ukraine
Journal: Stochastic processes and their applications, 1996, 61 (1) 85-108
ISSN: 0304-4149 CODEN: STOPB7 Availability: INIST-16235
Document Type: P (Serial) ; A (Analytic)
Country of Publication: Netherlands
Language: English Summary Language: English
Copyright (c) 1996 Elsevier Science B.V. All rights reserved. We study the asymptotic behavior of solutions of differential equations dx SUB epsilon (t)/dt=A(y(t/ epsilon))x SUB epsilon (t), x SUB epsilon (0)=x SUB 0 , where A(y), for y in a space Y, is a family of operators forming the generators of semigroups of bounded linear operators in a Hilbert space H, and y(t) is an ergodic jump Markov process in Y. Let A= integral A(y) rho (dy) where rho (dy) is the ergodic distribution of y(t). We show that under appropriate conditions as epsilon rightarrow 0 the process x SUB epsilon (t) converges uniformly in probability to the nonrandom function &xmacr;(t) which is the solution of the equation d&xmacr;(t)/dt=A&xmacr;(t), &xmacr;(0)=x SUB 0 and that epsilon SUP - SUP 1 SUP / SUP 2 (x SUB epsilon (t)-&xmacr;(t)) converges weakly to a Gaussian random function &xtilde;(t) for which a representation is obtained. Application to randomly perturbed partial differential equations with nonrandom initial and boundary conditions are included.

English Descriptors: Dynamical system; Stochastic system; Averaging method; Asymptotic expansion; Partial differential equation; Hilbert space; Bounded operator; Markov process; Jump process; Random function

French Descriptors: Systeme dynamique; Systeme stochastique; Methode moyenne; Developpement asymptotique; Equation derivee partielle; Espace Hilbert; Operateur borne; Processus Markov; Processus saut; Fonction aleatoire; Ergodicite uniforme; Perturbation markovienne

Classification Codes: 001A02H01C; 001A02H01I

1/5/181 (Item 26 from file: 144)
DIALOG(R)File 144:Pascal

12307336 PASCAL No.: 95-0541191
Randomly perturbed volterra integral equations and some applications
HOPPENSTEADT F ; SALEHI H; SKOROKHOD A
Michigan state univ., dep. statistics probability, East Lansing MI 48824-1027, USA
Journal: Stochastics and stochastics reports, 1995, 54 (1-2) 89-125
ISSN: 1045-1129 Availability: INIST-15625; 354000054691100050
No. of Refs.: 22 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: USA
Language: English

English Descriptors: Stochastic equation; Volterra integral equations; Volterra equation

French Descriptors: Equation stochastique; Equation integrale Volterra; Equation Volterra

Classification Codes: 001A02H01I

1/5/182 (Item 27 from file: 144)
DIALOG(R)File 144:Pascal

12155913 PASCAL No.: 95-0312503
A particle method for population waves
CHICHIA CHIU; **HOPPENSTEADT F C**
Michigan State univ., dep. mathematics, East Lansing MI 48824, USA
Journal: SIAM journal on applied mathematics, 1994, 54 (2) 466-477
ISSN: 0036-1399 Availability: INIST-4588; 354000045197660090
No. of Refs.: 14 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: USA
Language: English

Classification Codes: 001B

1/5/183 (Item 28 from file: 144)
DIALOG(R)File 144:Pascal

12072523 PASCAL No.: 95-0273194
Singular perturbation solutions of noisy systems
HOPPENSTEADT F C
Michigan State univ., dep. mathematics, East Lansing MI 48824, USA
Journal: SIAM journal on applied mathematics, 1995, 55 (2) 544-551
ISSN: 0036-1399 Availability: INIST-4588; 354000056274360120
No. of Refs.: 5 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: USA
Language: English

Recent work on singular perturbation solutions that persist in the presence of noise is described. Two different settings are considered: small deviation theory in quasi-static problems, where there are small

amplitude but highly irregular perturbations, and averaging problems where there are ergodic stochastic perturbations. In the first case, it is shown that quasi-static approximations can be valid when the underlying problem experiences small deviation perturbations in problems that are stable under persistent disturbances. In the second, averaging principles are described for certain dynamical systems in Hilbert spaces that include applications to a wide variety of initial-boundary value problems for partial differential equations and for Volterra integral equations. These methods are applied here to four problems arising in applications

English Descriptors: Singular perturbation; Dynamical system; Hilbert space ; Stochastic equation; Integral equation; Volterra equation; Averaging method; Random medium; Quasi stationary state

French Descriptors: Perturbation singuliere; Systeme dynamique; Espace Hilbert; Equation stochastique; Equation integrale; Equation Volterra; Methode moyenne; Milieu aleatoire; Etat quasi stationnaire; 0250F

Classification Codes: 001A02E07; 001B00B50F

1/5/184 (Item 29 from file: 144)
DIALOG(R)File 144:Pascal

11890851 PASCAL No.: 95-0056734
Analysis and simulation of chaotic systems
HOPPENSTEADT F C
Michigan state univ., coll. natural sci., East Lansing MI 48824-1115, USA
Journal: Applied mathematical sciences, 1993, 94 305 p.
ISSN: 0066-5452 CODEN: AMSCDF Availability: INIST-15398; 354000033263610000
No. of Refs.: 7 p.
Document Type: P (Serial) ; M (Monographic)
Country of Publication: USA
Language: English

English Descriptors: Dynamical systems; Non linear system; Chaotic systems; Non linear oscillation; Free oscillation; Forced oscillation; Stability; Perturbation method

French Descriptors: Systeme dynamique; Systeme non lineaire; Systeme chaotique; Oscillation non lineaire; Oscillation libre; Oscillation forcee; Stabilite; Methode perturbation; 0320; 0545; 0240V

Classification Codes: 001B00C20; 001B00E45; 001B00B40V

1/5/185 (Item 30 from file: 144)
DIALOG(R)File 144:Pascal

10712889 PASCAL No.: 93-0222203
Signal processing by model neural networks
HOPPENSTEADT F C
Michigan state univ., dep. mathematics, East Lansing MI 48824, USA
Journal: SIAM review, 1992, 34 (3) 426-444
ISSN: 0036-1445 Availability: INIST-9152; 354000030476780040
No. of Refs.: 55 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: USA
Language: English

English Descriptors: Signal processing; Neural network; Phase locked loop; Non linear oscillator; Analog control; Harmonic analysis; Neuron

French Descriptors: Traitement signal; Reseau neuronal; Boucle verrouillage phase; Oscillateur non lineaire; Commande analogique; Analyse harmonique; Neurone

Classification Codes: 001D03G03

1/5/186 (Item 31 from file: 144)
DIALOG(R)File 144:Pascal

10232823 PASCAL No.: 92-0438726
Memory, learning and neuromediators
IZHIKEVICH E M ; MIKHAILOV A S; SVESHNIKOV N A
Moscow state univ., dep. applied mathematics cybernetics, Moscow 117234, Union of Soviet Socialist Republics
Journal: Biosystems, 1991, 25 (4) 219-229
ISSN: 0303-2647 CODEN: BSYMBO Availability: INIST-13539; 354000010603760020
No. of Refs.: 14 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: Netherlands
Language: English

English Descriptors: Mathematical model; Brain (vertebrata); Human; Memory; Neuromediator; Synapse

French Descriptors: Modele mathematique; Encephale; Homme; Memoire; Neuromediateur; Synapse

Classification Codes: 002A25G

1/5/187 (Item 32 from file: 144)
DIALOG(R)File 144:Pascal

10193721 PASCAL No.: 92-0399515
The searchlight hypothesis
HOPPENSTEADT F C
Michigan state univ., dep. mathematics, East Lansing MI 48824, USA
Journal: Journal of mathematical biology, 1991, 29 (7) 689-691
ISSN: 0303-6812 CODEN: JMBLAJ Availability: INIST-16260; 354000012084390050
No. of Refs.: 3 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: Federal Republic of Germany
Language: English

English Descriptors: Mathematical model; Cell culture; Brain (vertebrata); Nervous system; Stimulus; Neuron

French Descriptors: Modele mathematique; Culture cellulaire; Encephale; Systeme nerveux; Stimulus; Neurone

Classification Codes: 002A25A

1/5/188 (Item 33 from file: 144)
DIALOG(R)File 144:Pascal

09757799 PASCAL No.: 91-0554971
Intermittent chaos, self-organization, and learning from synchronous

synaptic activity in model neuron networks
HOPPENSTEADT F C
Michigan state univ., dep. mathematics, East Lansing MI 48823, USA
Journal: Proceedings of the National Academy of Sciences of the United States of America (1985), 1989, 86 (9) 2991-2995
ISSN: 518654 CODEN: PNASA6 Availability: CNRS-574
No. of Refs.: 28 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: USA
Language: English

English Descriptors: Neural network

French Descriptors: Reseau neuronal

Classification Codes: 001B01C04

1/5/189 (Item 34 from file: 144)
DIALOG(R)File 144:Pascal

08025478 PASCAL No.: 88-0025477
Frequency modulation dynamics in neural networks
HOPPENSTEADT F C
Michigan state univ., dep. mathematics, East Lansing MI 48824, USA
Journal: Annals of the New York Academy of Sciences, 1987, 504 52-61
ISSN: 0077-8923 Availability: CNRS-600
No. of Refs.: 12 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: USA
Language: ENGLISH
Reponses en frequence des neurones, modele du type oscillateur commande par la tension, reseaux de neurones

English Descriptors: Neuron; Nervous network; Models

French Descriptors: Neurone; Reseau nerveux; Modele

Classification Codes: 002A25C

1/5/190 (Item 35 from file: 144)
DIALOG(R)File 144:Pascal

08000648 PASCAL No.: 88-0000648
A mathematical analysis of small mammal populations
HOPPENSTEADT F C ; MURPHY L
Michigan state univ., dep. mathematics, East Lansing MI 48824, USA
Journal: Journal of mathematical biology, 1987, 25 (3) 263-274
ISSN: 0303-6812 CODEN: JMBLAJ Availability: CNRS-16260
No. of Refs.: 4 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: Federal Republic of Germany
Language: ENGLISH

English Descriptors: Rodentia; Population dynamics; Models
Broad Descriptors: Mammalia; Vertebrata; Mammalia; Vertebrata; Mammalia; Vertebrata

French Descriptors: Rodentia; Dynamique population; Modele; Microtus montanus

Classification Codes: 002A14B03C2D

1/5/191 (Item 36 from file: 144)
DIALOG(R)File 144:Pascal

07008185 PASCAL No.: 86-0008185
A hysteresis model for bacterial growth patterns
HOPPENSTEADT F C ; JAEGER W; POEPPE C
Univ. Utah, dep. mathematics, Salt Lake City UT, USA
Modelling of patterns in space and time. Workshop (Heidelberg) 1983
Journal: Lecture Notes in Biomathematics, 1984, 55 123-134
ISSN: 0341-633X Availability: CNRS-16773
No. of Refs.: 15 ref.
Document Type: P (Serial); C (Conference Proceedings) ; A (Analytic)
Country of Publication: Federal Republic of Germany
Language: ENGLISH

English Descriptors: Growth; Microorganism culture; Mathematical model; Bacteria

French Descriptors: Croissance; Culture microorganisme; Modele mathematique ; Bacterie

Classification Codes: 002A05B05

1/5/192 (Item 37 from file: 144)
DIALOG(R)File 144:Pascal

06099553 PASCAL No.: 85-0361180
Stable oscillations of weakly nonlinear Volterra integro-differential equations
HOPPENSTEADT F C ; SCHIAFFINO A
Univ. Utah, dep. mathematics, Salt Lake City UT 84112, USA
Journal: Journal fuer die reine und angewandte Mathematik, 1984 (353) 1-13
ISSN: 0075-4102 Availability: CNRS-372
No. of Refs.: 5 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: Federal Republic of Germany
Language: English
On demontre l'existence de solutions periodiques pour des equations integrodifferentielles de type Volterra

English Descriptors: Integrodifferential equation; Volterra equation; Periodic solution; Existence theorem

French Descriptors: Equation integrodifferentielle; Equation Volterra; Solution periodique; Theoreme existence

Classification Codes: 001A02F03

1/5/193 (Item 38 from file: 144)
DIALOG(R)File 144:Pascal

05680733 PASCAL No.: 84-0181387
An extrapolation method for the numerical solution of singular perturbation problems
HOPPENSTEADT F C ; MIRANKER W L
Univ. Utah, dep. mathematics, Salt Lake City UT 84112, USA
Journal: SIAM journal on scientific and statistical computing, 1983, 4 (

4) 612-625
ISSN: 0196-5204 Availability: CNRS-18919
No. of Refs.: 7 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: USA
Language: English
On montre comment la forme de l'approximation perturbation pour la resolution de systemes d'equations differentielles a petit parametre identifiable peut s'utiliser pour generer des equations non stiff ou relaxees

English Descriptors: Differential equation; Equation system; Singular perturbation; Extrapolation

French Descriptors: Equation differentielle; Systeme equation; Perturbation singuliere; Extrapolation

Classification Codes: 001A02E09

1/5/194 (Item 39 from file: 144)
DIALOG(R)File 144:Pascal

05565021 PASCAL No.: 84-0065322
An algorithm for approximate solutions to weakly filtered synchronous control systems and nonlinear renewal processes
HOPPENSTEADT F C
Univ. Utah, dep. mathematics, Salt Lake City UT 84112, USA
Journal: SIAM Journal on applied Mathematics, 1983, 43 (4) 834-843
ISSN: 0036-1399 Availability: CNRS-4588
No. of Refs.: 11 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: USA
Language: English
On deduit un algorithme de perturbation multitemps pour etudier des systemes de commande synchrones et des processus de renouvellement non lineaires

English Descriptors: Control; Perturbation method; Approximation; Algorithm ; Renewal process; Non linear system; Volterra equation

French Descriptors: Commande; Methode perturbation; Approximation; Algorithme; Processus renouvellement; Systeme non lineaire; Equation Volterra; Systeme synchrone

Classification Codes: 001D02D07

1/5/195 (Item 40 from file: 144)
DIALOG(R)File 144:Pascal

04885762 PASCAL No.: 83-0133285
Phase locking of biological clocks
HOPPENSTEADT F C ; KEENER J P
Univ. Utah, dep. mathematics, Salt Lake City UT 84112, USA
Journal: J. math. biol., 1982, 15 (3) 339-349
ISSN: 0303-6812 Availability: CNRS-16260
No. of Refs.: 17 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: Federal Republic of Germany
Language: English
Le modele de Fitzttugh-Nagumo permet de decrire de facon simple et satisfaisante les horloges radiales isochrones (RIC) qui sont etudiees ici lorsqu'elles sont soit isolees soit couplees. Modelisation des ruptures de

rythmes observees chez les poissons, les oiseaux et les mammiferes et consequents a des modifications de l'intensite lumineuse

English Descriptors: Biological rhythm; Biological clock; Vertebrata; Models

French Descriptors: Rythme biologique; Horloge biologique; Vertebrata; Modele

Classification Codes: 365A05A04

1/5/196 (Item 41 from file: 144)
DIALOG(R)File 144:Pascal

04872185 PASCAL No.: 83-0118808
Photoperiodic induction of diurnal locomotor activity in Microtus montanus, the montane vole
ROWSEMITT C N; PETTERBORG L J; CLAYPOOL L E; **HOPPENSTEADT F C** ; NEGUS N C; BERGER P J
Univ. Utah, dep. biology, Salt Lake City UT 84112, USA
Journal: Can. j. zool., 1982, 60 (11) 2798-2803
ISSN: 0008-4301 Availability: CNRS-523D
No. of Refs.: 22 ref.
Document Type: P (Serial) ; A (Analytic)
Country of Publication: Canada
Language: English Summary Language: French
Au laboratoire, en modifiant la photoperiode, on peut provoquer, chez M.m., le passage d'une activite nocturne a une activite diurne. Dans la nature, il s'agit peut etre d'un mecanisme pour eviter les micro-climats trop rigoureux

English Descriptors: Rodentia; Animal activity; Locomotion; Circadien rhythm; Photoperiod; Mammalia; Environment; Adaptation
Broad Descriptors: Vertebrata; Vertebrata
French Descriptors: Rodentia; Activite animale; Locomotion; Rythme circadien; Photoperiode; Mammalia; Environnement; Adaptation; Microtus montanus

Classification Codes: 365B02D06

1/5/197 (Item 42 from file: 144)
DIALOG(R)File 144:Pascal

03934650 PASCAL No.: 75-0112974
ANALYSIS OF SOME PROBLEMS HAVING MATCHED ASYMPTOTIC EXPANSION SOLUTIONS.
HOPPENSTEADT F
COURANT INST. MATH. SCI., NEW YORK UNIV., NEW YORK,N.Y. 10012
Journal: S.I.A.M. REV., 1975, 17 (1) 123-135
Availability: CNRS-9152
No. of Refs.: 1 P. 1/2
Document Type: P (SERIAL) ; A (ANALYTIC)
Country of Publication: USA
Language: ENGLISH

English Descriptors: EQUATION; EVOLUTION EQUATION
English Generic Descriptors: MATHEMATICS

French Descriptors: EQUATION; EQUATION EVOLUTION
French Generic Descriptors: MATHEMATIQUES

Classification Codes: 130A02C

1/5/198 (Item 43 from file: 144)
DIALOG(R)File 144:Pascal

03927513 PASCAL No.: 75-0101774
ASYMPTOTIC BEHAVIOR OF SOLUTIONS TO A POPULATION EQUATION.
GREENBERG J M; **HOPPENSTEADT F**
COURANT INST. MATH. SCI., NEW YORK UNIV., NEW YORK,N.Y. 10012
Journal: S.I.A.M. J. APPL. MATH., 1975, 28 (3) 662-674
Availability: CNRS-4588
No. of Refs.: 3 REF.
Document Type: P (SERIAL) ; A (ANALYTIC)
Country of Publication: USA
Language: ENGLISH

English Descriptors: ASYMPTOTIC BEHAVIOR; EQUATION; INTEGRAL EQUATION; NON LINEAR EQUATION
English Generic Descriptors: MATHEMATICS

French Descriptors: EQUATION; EQUATION INTEGRALE; EQUATION NON LINEAIRE; COMPORTEMENT ASYMPTOTIQUE; EQUATION POPULATION
French Generic Descriptors: MATHEMATIQUES

Classification Codes: 110A08

1/5/199 (Item 44 from file: 144)
DIALOG(R)File 144:Pascal

03871273 PASCAL No.: 75-0001076
AN AGE DEPENDENT EPIDEMIC MODEL.
HOPPENSTEADT F
COURANT INST. MATH. SCI.,NEW YORK
Journal: J. FRANKLIN INST., 1974, 297 (5) 325-333
Availability: CNRS-555
No. of Refs.: 7 REF.
Document Type: P (SERIAL) ; A (ANALYTIC)
Country of Publication: USA
Language: ENGLISH
MODELE DECRIVANT L'ETENDUE D'UNE INFECTION DANS UNE POPULATION EN PRENANT EN CONSIDERATION LES AGES CHRONOLOGIQUES DES PARTICIPANTS, AINSI QUE LEURS "CLASSES D'AGES" (DUREE DEPUIS LE MOMENT DE LEUR ENTREE DANS L'ETAT ACTUEL)

English Descriptors: BIOMETRY; EPIDEMIOLOGY; STOCHASTIC MODEL
English Generic Descriptors: MATHEMATICS

French Descriptors: BIOMETRIE; EPIDEMIOLOGIE; MODELE STOCHASTIQUE
French Generic Descriptors: MATHEMATIQUES

Classification Codes: 110G04B

1/5/200 (Item 45 from file: 144)
DIALOG(R)File 144:Pascal

03626668 PASCAL No.: 82-0141473
INTEGRATE- AND -FIRE MODELS OF NERVE MEMBRANE RESPOSE TO OSCILLATORY INPUT
KEENER J P; **HOPPENSTEADT F C** ; RINZEL J
UNIV. UTAH, DEP. MATH./LAKE CITY UT 84112,USA
Journal: SIAM J. APPL. MATH., 1981, 41 (3) 503-517
ISSN: 0036-1399 Availability: CNRS-4588

No. of Refs.: 13 REF.
Document Type: P (SERIAL) ; A (ANALYTIC)
Country of Publication: USA
Language: ENGLISH
ON ETUDIE LA REPONSE A DES ENTREES PERIODIQUES POUR UN MODELE DE HODGKIN-HAXLEY SIMPLIFIE

English Descriptors: PLASMA MEMBRANE; ELECTROPHYSIOLOGY; THEORY; MODELS; MATHEMATICS; NERVE FIBER; THEORY;THEORETICAL STUDIES
English Generic Descriptors: VERTEBRATES PHYSIOLOGY; VERTEBRATES NEUROPHYSIOLOGY

French Descriptors: FIBRE NERVEUSE; MEMBRANE PLASMIQUE; ELECTROPHYSIOLOGIE; THEORIE; MODELE; MATHEMATIQUES
French Generic Descriptors: PHYSIOLOGIE DES VERTEBRES; NEUROPHYSIOLOGIE DES VERTEBRES

Classification Codes: 365A05K03

1/5/201 (Item 46 from file: 144)
DIALOG(R)File 144:Pascal

01842233 PASCAL No.: 78-0349756
ITERATED AVERAGING METHODS FOR SYSTEMS OF ORDINARY DIFFERENTIAL EQUATIONS WITH A SMALL PARAMETER.
PERSEK S C; **HOPPENSTEADT F C**
UNIV. UTAH,
Journal: COMMUNIC. PURE APPL. MATH., 1978, 31 (2) 133-156
Availability: CNRS-5120
No. of Refs.: 5 REF.
Document Type: P (SERIAL) ; A (ANALYTIC)
Country of Publication: USA
Language: ENGLISH

English Descriptors: DIFFERENTIAL EQUATION; SINGULAR EQUATION; ITERATIVE METHODS; AVERAGING METHOD; EQUATION SYSTEM
English Generic Descriptors: MATHEMATICS

French Descriptors: EQUATION DIFFERENTIELLE; SYSTEME EQUATION; EQUATION SINGULIERE; METHODE ITERATIVE; METHODE MOYENNE
French Generic Descriptors: MATHEMATIQUES

Classification Codes: 110A06

1/5/202 (Item 47 from file: 144)
DIALOG(R)File 144:Pascal

01821682 PASCAL No.: 78-0243796
FREQUENCY ENTRAINMENT OF A FORCED VAN DER POL OSCILLATOR.
FLAHERTY J E; **HOPPENSTEADT F C**
DEP. MATH., UNIV. UTAH, SALT LAKE CITY,UTAH 84114
Journal: STUD. APPL. MATH., 1978, 58 (1) 5-15
Availability: CNRS-546
No. of Refs.: 16 REF.
Document Type: P (SERIAL) ; A (ANALYTIC)
Country of Publication: USA
Language: ENGLISH

English Descriptors: EQUATION; DIFFERENTIAL EQUATION; VAN DER POL EQUATION; OSCILLATOR; FORCED OSCILLATION; OSCILLATORY SOLUTION; STABILITY
English Generic Descriptors: MATHEMATICS

French Descriptors: EQUATION; EQUATION DIFFERENTIELLE; SOLUTION OSCILLATOIRE; OSCILLATEUR; EQUATION VAN DER POL; OSCILLATION FORCEE; STABILITE
French Generic Descriptors: MATHEMATIQUES

Classification Codes: 130A02C

1/5/203 (Item 48 from file: 144)
DIALOG(R)File 144:Pascal

01796228 PASCAL No.: 78-0099807
SLOWLY MODULATED OSCILLATIONS IN NONLINEAR DIFFUSION PROCESSES.
COHEN D S; **HOPPENSTEADT F C** ; MIURA R M
CALIFORNIA INST. TECHNOL., PASADENA, CALIF. 91125
Journal: S.I.A.M. J. APPL. MATH., 1977, 33 (2) 217-229
Availability: CNRS-4588
No. of Refs.: 19 REF.
Document Type: P (SERIAL) ; A (ANALYTIC)
Country of Publication: USA
Language: ENGLISH
ON MONTRE QUE CERTAINS SYSTEMES D'EQUATIONS DE DIFFUSION PARABOLIQUES NON LINEAIRES ONT DES SOLUTIONS QUI SONT APPROXIMEES PAR DES FONCTIONS OSCILLANTES DE LA FORME R(X-CT)P(T') OU P(T') EST UNE OSCILLATION SINUSOIDALE SUR UNE ECHELLE DE TEMPS RAPIDE ET R(X-CT) UNE AMPLIDE A MODULATION LENTE SUR UNE ECHELLE DE TEMPS LENTE. ON PRESENTE DES EXEMPLES.

English Descriptors: DIFFUSION EQUATION; DIFFUSION PROCESS; EQUATION SYSTEM ; NON LINEAR THEORY; TRANSPORT THEORY
English Generic Descriptors: THEORETICAL PHYSICS

French Descriptors: THEORIE TRANSPORT; PROCESSUS DIFFUSION; THEORIE NON LINEAIRE; EQUATION DIFFUSION; SYSTEME EQUATION
French Generic Descriptors: PHYSIQUE THEORIQUE

Classification Codes: 130A05E

1/5/204 (Item 49 from file: 144)
DIALOG(R)File 144:Pascal

01777096 PASCAL No.: 78-0002124
MULTITIME METHODS FOR SYSTEMS OF DIFFERENCE EQUATIONS.
HOPPENSTEADT F C ; MIRANKER W L
Journal: STUD. APPL. MATTR., 1977, 56 (3) 273-289
Availability: CNRS-546
No. of Refs.: 5 REF.
Document Type: P (SERIAL) ; A (ANALYTIC)
Country of Publication: USA
Language: ENGLISH
ON ETUDIE DES SYSTEMES D'EQUATIONS AUX DIFFERENCES CONTENANT DE PETITS PARAMETRES A L'AIDE D'UN SCHEMA DE PERTURBATION CONSTRUCTIF ANALOGUE A CELUI DEVELOPPE POUR L'ETUDE DES EQUATIONS DIFFERENTIELLES.

English Descriptors: EQUATION; DIFFERENCE EQUATION; EQUATION SYSTEM; PERTURBATION THEORY
English Generic Descriptors: MATHEMATICS

French Descriptors: EQUATION; EQUATION DIFFERENCES; SYSTEME EQUATION; THEORIE PERTURBATION
French Generic Descriptors: MATHEMATIQUES

Classification Codes: 110A02A

1/5/205 (Item 50 from file: 144)
DIALOG(R)File 144:Pascal

01512853 PASCAL No.: 77-0245496
SYNCHRONIZATION OF PERIODICAL CICADA EMERGENCES.
HOPPENSTEADT F C ; KELLER J B
COURANT INST. MATH. SCI., NEW YORK UNIV.,NEW YORK 10012
Journal: SCIENCE, 1976, 194 (4262) 335-337
Availability: CNRS-6040
No. of Refs.: DISSEM.
Document Type: P (SERIAL) ; A (ANALYTIC)
Country of Publication: USA
Language: ENGLISH
LES ECLOSIONS SYNCHRONISEES SE MANIFESTENT POUR DES INSECTES DONT LE CYCLE EST DE 10 ANS ET PLUS ET LES ECLOSIONS NON SYNCHRONISEES POUR LES INSECTES DONT LE CYCLE EST INFERIEUR A 10 ANS.

English Descriptors: MATHEMATICAL ANALYSIS; CARRYING CAPACITY; CICADIDAE; BIOLOGICAL CYCLE; HATCHING; ENVIRONMENT; MAGICICADA; MATHEMATICAL MODELS; SYNCHRONIZATION
English Generic Descriptors: ECOLOGY

French Descriptors: ECLOSION; ENVIRONNEMENT; SYNCHRONISATION; CAPACITE LIMITE; MODELE MATHEMATIQUE; CYCLE BIOLOGIQUE; ANALYSE MATHEMATIQUE; INVERTEBRE; INSECTE; HOMOPTERE; MAGICICADA; CICADIDAE; ANIMAL DEPREDATEUR
French Generic Descriptors: ECOLOGIE

Classification Codes: 360C03C10

1/5/206 (Item 51 from file: 144)
DIALOG(R)File 144:Pascal

01431668 PASCAL No.: 77-0047021
A SLOW SELECTION ANALYSIS OF TWO LOCUS, TWO ALLELE TRAITS.
(ANALYSE D'UNE SELECTION LENTE A DEUX LOCI, POUR DEUX CARACTERES ALLELIQUES)
HOPPENSTEADT F C
COURANT INST. MATH. SCI., NEW YORK UNIV., NEW YORK,N.Y. 10012
Journal: THEOR. POPUL. BIOL., 1976, 9 (1) 68-81
Availability: CNRS-15511
No. of Refs.: 13 REF.
Document Type: P (SERIAL) ; A (ANALYTIC)
Country of Publication: USA
Language: ENGLISH
UN MODELE DETERMINISTE EN TEMPS CONTINU DE L'EVOLUTION DE DEUX LOCI DANS UNE LARGE POPULATION DIPLOIDE, SE CROISANT AU HASARD ET SOUMISE A DE PETITES FORCES SELECTIVES EST DONNE. LES CAS DE LIAISON FORTE ET FAIBLE SONT ETUDIES.

English Descriptors: MATHEMATICAL ANALYSIS; GENETIC EQUILIBRIUM; POPULATION GENETICS; LINKAGE; GENETIC SELECTION; THEORY;THEORETICAL STUDIES
English Generic Descriptors: GENETICS
French Descriptors: ANALYSE MATHEMATIQUE; SELECTION GENETIQUE; EQUILIBRE GENETIQUE; LINKAGE; THEORIE; GENETIQUE POPULATION; MATERIEL NON PRECISE
French Generic Descriptors: GENETIQUE

Classification Codes: 363A12A

1/5/207 (Item 52 from file: 144)
DIALOG(R)File 144:Pascal

01359525 PASCAL No.: 77-0279432
PERIODIC SOLUTIONS OF A LOGISTIC DIFFERENCE EQUATION.
HOPPENSTEADT F C ; HYMAN J M
COURANT INST. MATH. SCI., NEW YORK,N.Y. 10012
Journal: S.I.A.M. J. APPL. MATH., 1977, 32 (1) 73-81
Availability: CNRS-4588
No. of Refs.: 10 REF.
Document Type: P (SERIAL) ; A (ANALYTIC)
Country of Publication: USA
Language: ENGLISH

ON ETUDIE LES SOLUTIONS DE L'EQUATION AUX DIFFERENCES X(N+1)=MX(N) X (1-X(N)) POUR M COMPRIS ENTRE 0 ET 4. ON ETUDIE LE COMPORTEMENT DES SOLUTIONS EN REGIME CHAOTIQUE. FINALEMENT ON CALCULE NUMERIQUEMENT LES FONCTIONS DE DENSITE POUR DECRIRE LE COMPORTEMENT DYNAMIQUE DES SOLUTIONS EN REGIME CHAOTIQUE.

English Descriptors: EQUATION; DIFFERENCE EQUATION; ITERATION; PERIODIC SOLUTION; STABILITY
English Generic Descriptors: MATHEMATICS

French Descriptors: EQUATION; EQUATION DIFFERENCES; SOLUTION PERIODIQUE; ITERATION; STABILITE
French Generic Descriptors: MATHEMATIQUES

Classification Codes: 110A02A

1/5/208 (Item 53 from file: 144)
DIALOG(R)File 144:Pascal

01336011 PASCAL No.: 77-0165718
DIFFERENTIAL EQUATIONS HAVING RAPIDLY CHANGING SOLUTIONS: ANALYTIC METHODS FOR WEAKLY NONLINEAR SYSTEMS.
HOPPENSTEADT F C ; MIRANKER W L
COURANT INST. MATH. SCI., NEW YORK UNIV.,N.Y. 10012
Journal: J. DIFFER. EQUATIONS, 1976, 22 (2) 237-249
Availability: CNRS-13013
No. of Refs.: 4 REF.
Document Type: P (SERIAL) ; A (ANALYTIC)
Country of Publication: USA
Language: ENGLISH

ON ETUDIE DES PROBLEMES DE VALEUR INITIALE POUR DES SYSTEMES DIFFERENTIELS FAIBLEMENT NON LINEAIRES. ON OBTIENT UNE SOLUTION APPROCHEE A L'AIDE DE LA THEORIE DES PERTURBATIONS APPLIQUEE A DEUX PROBLEMES ASSOCIES. LA METHODE EST BIEN ADAPTEE AU CAS OU LES SOLUTIONS SONT RAPIDEMENT DECROISSANTES ET OSCILLANTES.

English Descriptors: DIFFERENTIAL EQUATION; NON LINEAR EQUATION; INITIAL VALUE PROBLEM
English Generic Descriptors: MATHEMATICS
French Descriptors: EQUATION DIFFERENTIELLE; EQUATION NON LINEAIRE; PROBLEME VALEUR INITIALE
French Generic Descriptors: MATHEMATIQUES

Classification Codes: 110A06

1/5/209 (Item 54 from file: 144)
DIALOG(R)File 144:Pascal

00957782 PASCAL No.: 76-0097334

ANALYSIS OF A STABLE POLYMORPHISM ARISING IN A SELECTION-MIGRATION MODEL IN POPULATION GENETICS.
HOPPENSTEADT F C
COURANT INST. MATH. SCI., NEW YORK UNIV., NEW YORK, N.Y. 10012,USA
Journal: J. MATH. BIOL., 1975, 2 (3) 235-240
Availability: CNRS-16260
No. of Refs.: 3 REF.
Document Type: P (SERIAL) ; A (ANALYTIC)
Country of Publication: FEDERAL REPUBLIC OF GERMANY
Language: ENGLISH

English Descriptors: GENETIC EQUILIBRIUM; POPULATION GENETICS; ANIMAL MIGRATION; POPULATION MIGRATION; MATHEMATICAL MODELS; POLYMORPHISM; GENETIC SELECTION; THEORY;THEORETICAL STUDIES
English Generic Descriptors: GENETICS

French Descriptors: MODELE MATHEMATIQUE; MIGRATION POPULATION; MIGRATION ANIMALE; SELECTION GENETIQUE; POLYMORPHISME; EQUILIBRE GENETIQUE; THEORIE ; GENETIQUE POPULATION
French Generic Descriptors: GENETIQUE

Classification Codes: 363A12A

1/5/210 (Item 55 from file: 144)
DIALOG(R)File 144:Pascal

00824624 PASCAL No.: 76-0083155
NONLINEAR STABILITY ANALYSIS OF STATIC STATES WHICH ARISE THROUGH BIFURCATION.
HOPPENSTEADT F ; GORDON N
COURANT INST.,
Journal: COMMUNIC. PURE APPL. MATH., 1975, 28 (3) 355-373
Availability: CNRS-5124
No. of Refs.: 14 REF.
Document Type: P (SERIAL) ; A (ANALYTIC)
Country of Publication: USA
Language: ENGLISH

English Descriptors: EQUATION; EVOLUTION EQUATION; NON LINEAR EQUATION; BIFURCATION THEORY
English Generic Descriptors: MATHEMATICS

French Descriptors: EQUATION; EQUATION EVOLUTION; EQUATION NON LINEAIRE; THEORIE BIFURCATION
French Generic Descriptors: MATHEMATIQUES

Classification Codes: 130A02C

1/5/211 (Item 1 from file: 239)
DIALOG(R)File 239:Mathsci

03603894 CMP 2 072 349
Modeling the cumulative distribution function of spikes in neural networks.
Hoppensteadt, Frank (Department of Electrical Engineering, Arizona State University, Tempe, Arizona, 85287
Corporate Source Codes: 1-AZS-ELE
Internat. J. Bifur. Chaos Appl. Sci. Engrg.
International Journal of Bifurcation and Chaos in Applied Sciences and Engineering, 2004, 14, no. 5, 1549--1558. ISSN: 0218-1274
Language: English Summary Language: English
Document Type: Journal
Journal Announcement: 200415

Subfile: CMP (Current Mathematical Publications) AMS
Review Type: Abstract
Descriptors: *37N25 -Dynamical systems and ergodic theory (See also 26A18, 28Dxx, 34Cxx, 34Dxx, 35Bxx, 46Lxx, 58Jxx, 70-XX)-Applications-Dynamical systems in biology (See mainly 92-XX, but also 91-XX) ; 92C20 - Biology and other natural sciences-Physiological, cellular and medical topics-Neural biology

1/5/212 (Item 2 from file: 239)
DIALOG(R)File 239:Mathsci

03551492 MR 2004g#37118
Did something change? Thresholds in population models.
Trends in nonlinear analysis
Hoppensteadt, Frank (Center for Systems Science and Engineering, Arizona State University, Tempe, Arizona, 85287)
Waltman, Paul (Department of Mathematics and Computer Science, Emory University, Atlanta, Georgia, 30329
Corporate Source Codes: 1-AZS-CSY; 1-EMRY-CS
2003,
Springer, Berlin,; 341--374,,
Language: English Summary Language: English
Document Type: Proceedings Paper
Journal Announcement: 200401
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (13 lines)
The goal of this book chapter is to present several interesting, canonical types of bifurcations (including cusp, fold and Andronov-Hopf) that occur in continuous and discrete time models of population biology. These include models of epidemics, fisheries and predator-prey systems (without and with random perturbations). As stated by the authors, the selection of the models reflects their interests. They give references to the literature in which the models are described in more detail, but do not attempt to give proofs of results or a comprehensive reference list. The authors have succeeded admirably in their goal. The chapter is recommended reading for anyone wanting to find out about these interesting bifurcations in the context of population biology.
\{For the entire collection see MR 2004c:00011.\}
Reviewer: van den Driessche, Pauline (3-VCTR-MS)
Review Type: Signed review
Proceedings Reference: 2004c#00011; 1 999 095
Descriptors: *37N25 -Dynamical systems and ergodic theory (See also 26A18, 28Dxx, 34Cxx, 34Dxx, 35Bxx, 46Lxx, 58Jxx, 70-XX)-Applications-Dynamical systems in biology (See mainly 92-XX, but also 91-XX) ; 34C23 - Ordinary differential equations-Qualitative theory (See also 37-XX)-Bifurcation (See mainly 37Gxx); 34C60 -Ordinary differential equations-Qualitative theory (See also 37-XX)-Applications; 37G10 -Dynamical systems and ergodic theory (See also 26A18, 28Dxx, 34Cxx, 34Dxx, 35Bxx, 46Lxx, 58Jxx, 70-XX)-Local and nonlocal bifurcation theory (See also 34C23, 34K18) -Bifurcations of singular points; 92D25 -Biology and other natural sciences-Genetics and population dynamics-Population dynamics (general)

1/5/213 (Item 3 from file: 239)
DIALOG(R)File 239:Mathsci

03533710 CMP 2 030 851
Slowly coupled oscillators: phase dynamics and synchronization.
Izhikevich, Eugene M.
Hoppensteadt, Frank C. (Center for Systems Science and Engineering, Arizona State University, Tempe, Arizona, 85287
(Izhikevich, E. M.)
Corporate Source Codes: 1-AZS-CSY
SIAM J. Appl. Math.

SIAM Journal on Applied Mathematics, 2003, 63, no. 6, 1935--1953 (electronic). ISSN: 1095-712X
Language: English Summary Language: English
Document Type: Journal
Journal Announcement: 200407
Subfile: CMP (Current Mathematical Publications) AMS
Review Type: Review Pending
Descriptors: *37N25 -Dynamical systems and ergodic theory (See also 26A18, 28Dxx, 34Cxx, 34Dxx, 35Bxx, 46Lxx, 58Jxx, 70-XX)-Applications-Dynamical systems in biology (See mainly 92-XX, but also 91-XX) ; 34C15 -Ordinary differential equations-Qualitative theory (See also 37-XX)-Nonlinear oscillations, coupled oscillators; 92C20 -Biology and other natural sciences-Physiological, cellular and medical topics-Neural biology

1/5/214 (Item 4 from file: 239)
DIALOG(R)File 239:Mathsci

03526238 MR 2004e#34066
System of phase oscillators with diagonalizable interaction.
Nishikawa, Takashi (Department of Mathematics, Arizona State University, Tempe, Arizona, 85287)
Hoppensteadt, Frank C. (Department of Mathematics, Arizona State University, Tempe, Arizona, 85287
Corporate Source Codes: 1-AZS; 1-AZS
SIAM J. Appl. Math.
SIAM Journal on Applied Mathematics, 2003, 63, no. 5, 1615--1626 (electronic). ISSN: 1095-712X
Language: English Summary Language: English
Document Type: Journal
Journal Announcement: 200401
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (21 lines)
Y. Kuramoto [Chemical oscillations, waves, and turbulence, Springer, Berlin, 1984; MR 87e:92054] showed that in his mean-field model consisting of N coupled oscillators, in the limit as $N \to \infty$ there exists a critical coupling strength $\epsilon\sb c$ such that for $\epsilon < \epsilon\sb c$ the solution is incoherent but for $\epsilon > \epsilon\sb c$ partially coherent solutions appear with a nonzero fraction of locked pairs of oscillators. In the present paper the authors consider a class of N phase oscillators with randomly distributed natural frequencies and diagonalizable interactions between the oscillators. For this class of system complete separation of variables through an appropriate change of variable is possible. Some properties of diagonalizable systems are established. The behaviour of a generic diagonalizable system in the limit as $N \to \infty$ is described. It is shown that in the limit as $N \to \infty$, all solutions of above types of systems are incoherent with probability one for any strength of coupling. The implication of this result is that there is no sharp transition from incoherence to coherence as the coupling strength is increased in diagonalizable systems.
Reviewer: Rajasekar, S. (Tirunelveli)
Review Type: Signed review
Descriptors: *34C15 -Ordinary differential equations-Qualitative theory (See also 37-XX)-Nonlinear oscillations, coupled oscillators ; 37N25 -Dynamical systems and ergodic theory (See also 26A18, 28Dxx, 34Cxx, 34Dxx, 35Bxx, 46Lxx, 58Jxx, 70-XX)-Applications-Dynamical systems in biology (See mainly 92-XX, but also 91-XX)

1/5/215 (Item 5 from file: 239)
DIALOG(R)File 239:Mathsci

03521198 CMP 2 021 079
Random perturbations of Volterra dynamical systems in neuroscience.
BIOCOMP2002: Topics in biomathematics and related computational problems

at the beginning of the third millennium (Vietri, 2002).

Hoppensteadt, Frank (Department of Mathematics, Arizona State University, Tempe, Arizona, 85287
Corporate Source Codes: 1-AZS

Sci. Math. Jpn.
Scientiae Mathematicae Japonicae, 2003, 58, no. 2, 353--358.
ISSN: 1346-0862
Language: English Summary Language: English
Document Type: Journal
Journal Announcement: 200406
Subfile: CMP (Current Mathematical Publications) AMS
Review Type: Review pending
Descriptors: *45D05 -Integral equations-Volterra integral equations (See also 34A12) ; 92C20 -Biology and other natural sciences-Physiological, cellular and medical topics-Neural biology

1/5/216 (Item 6 from file: 239)
DIALOG(R)File 239:Mathsci

03468593 MR 2003m#34129

Random perturbation methods with applications in science and engineering.

Skorokhod, Anatoli V. (Institute of Mathematics, National Academy of Sciences of Ukraine, Kiev, Ukraine)
Hoppensteadt, Frank C. (Center for Systems Science and Engineering, Arizona State University, Tempe, Arizona, 85287)
Salehi, Habib (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824
(Skorokhod, Anatolii)
Corporate Source Codes: UKR-AOS; 1-AZS-CSY; 1-MIS-S

Publ: Springer-Verlag, New York,
2002, xii+488 pp. ISBN: 0-387-95427-9
Series: Applied Mathematical Sciences, 150.
Price: \$79.95.
Language: English Summary Language: English
Document Type: Book
Journal Announcement: 200215
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (77 lines)

In the first half of their book (Chapters 1--7) the authors introduce the reader to the mathematical theory of randomly perturbed dynamical systems. They use the tools of this theory to study in detail the dynamics of real-world systems subject to random impact which are introduced in the second half of the book (Chapters 8--12). The systems considered here appear in mechanics (conservative systems with two degrees of freedom, dynamical systems on the torus (Chapters 8 and 9)), in quantum mechanics and electronics (the phase-locked loop, a standard electronic circuit (Chapter 10)), in population biology (predator-prey type systems (Chapter 11)) and in genetics (gene pool, plasmid stability for bacteria, evolution of the genome (Chapter 12)).

The common feature of these systems is that they can be modeled as Volterra integral equations which, mostly, can be reduced to ordinary differential equations, or as difference equations with randomly varying parameters. These parameters in turn are modeled as ergodic stationary or ergodic Markov processes $y(t/\epsilon)$ which vary at a much faster time-scale than the unperturbed system. A randomly perturbed system of this kind is close, in a certain sense, to a deterministic system that is obtained by averaging out the fast moving noise (first order approximation, Chapter 3: Averaging). Typically, if $\epsilon > 0$ is very small, the solution $x_{\epsilon}(t)$ of the differential equation $\dot x_{\epsilon}(t) = a(x_{\epsilon}(t), y(t/\epsilon))$ is close to the solution $\dot{\overline{x}}(t)$ of the deterministic ODE $\dot{\overline{x}}(t) =\overline{a}(\dot{\overline{x}}(t))$, where $\overline{a}(x) = \int{a(x,y)d\rho(y)}$, ρ the ergodic measure associated with the stochastic process $y(t/\epsilon)$.

The second order approximation is due to the fact that the suitably scaled differences, e.g. $\tilde{x}_{\epsilon}(t) =(1/\epsilon)[x_{\epsilon}(t) - \overline{x}(t)]$, converge to a Wiener process in the weak sense either with respect to only all finite-dimensional distributions, called weak convergence, or, stronger, with respect to the distribution of the random function $\tilde{x}_{\epsilon}(\cdot)$ with values in the infinite-dimensional space of continuous functions, called weak convergence in C (Chapter 2 and Chapter 4: Normal Deviations). These ideas are analogous to the convergence properties of real-valued random variables (Law of Large Numbers and Ergodic Theorems, Chapter 1, and the Central Limit Theorem (CLT)) and they include CLTs for strongly mixing Markov processes as well as for stationary and ergodic processes.

In Chapter 5 (Diffusion Approximation) the authors give conditions under which the speeded up state $x_{\epsilon}(t/\epsilon)$ of the randomly perturbed system can be approximated by the solution of a suitable diffusion equation, while in the comparatively long Chapter 6 (Stability) they investigate the long term stability properties (exponential growth rates or Lyapunov exponents) of randomly perturbed difference equations, ordinary differential equations and convolution integral equations as well as large deviations of systems starting near a stable steady state and noise induced oscillations between two steady states (stochastic resonance).

The theoretical part closes with a short introduction to the theory of Markov chains in random environments (Chapter 7) which provides the tools for studying the evolution of the genome in a random environment (Chapter 12, Section 3).

The book, published in the Springer series of Applied Mathematical Sciences, is written in mathematical terms. But the authors make the laudable attempt to introduce others, e.g. engineers and biologists (and non-expert mathematicians), to the area of randomly perturbed dynamical systems by starting the book with an Introduction that in less technical terms illustrates the main facts of the theory and how these facts help one better understand the dynamical systems considered by scientists and engineers. This, together with many computer-simulated visualizations, may make the book accessible to scientists and engineers with a general mathematical background. On the other hand, the chapters in the applied part of the book provide a knowledge of biological facts that are needed by a mathematician to understand the mathematical model of the real world.

The comments referring to the sources are sufficient, though very short. For a second edition a larger index and correction of the misprints would be appreciated.

Reviewer: Wihstutz, Volker (1-NC3)

Review Type: Signed review

Descriptors: *34F05 -Ordinary differential equations-Equations and systems with randomness (See also 34K50, 60H10, 93E03) ; 37H05 -Dynamical systems and ergodic theory (See also 26A18, 28Dxx, 34Cxx, 34Dxx, 35Bxx, 46Lxx, 58Jxx, 70-XX)-Random dynamical systems (See also 15A52, 34D08, 34F05, 47B80, 70L05, 82C05, 93Exx)-Foundations, general theory of cocycles, algebraic ergodic theory (See also 37Axx); 60H10 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 91-XX, 92-XX, 93-XX, 94-XX)-Stochastic analysis (See also 58J65)-Stochastic ordinary differential equations (See also 34F05); 60J25 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 91-XX, 92-XX, 93-XX, 94-XX)-Markov processes-Markov processes with continuous parameter; 60K37 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 91-XX, 92-XX, 93-XX, 94-XX)-Special processes-Processes in random environments; 92D10 -Biology and other natural sciences-Genetics and population dynamics-Genetics (For genetic algebras, see 17D92); 92D25 -Biology and other natural sciences-Genetics and population dynamics-Population dynamics (general)

1/5/217 (Item 7 from file: 239)

DIALOG(R)File 239:Mathsci

03387397 MR 2003d#92001

Modeling and simulation in medicine and the life sciences.

Second edition.

Hoppensteadt, Frank C. (Department of Mathematics, Arizona State University, Tempe, Arizona, 85287)

Peskin, Charles S. (Courant Institute of Mathematical Sciences, New York University, New York, New York, 10003

Corporate Source Codes: 1-AZS; 1-NY-X

Publ: Springer-Verlag, New York,

2002, xiv+354 pp. ISBN: 0-387-95072-9

Series: Texts in Applied Mathematics, 10.

Price: \$54.95.

Language: English Summary Language: English

Document Type: Book

Journal Announcement: 200202

Subfile: MR (Mathematical Reviews) AMS

Abstract Length: LONG (50 lines)

This is an introductory book on mathematical modeling in the bio-sciences. It is written for mathematicians as well as for life scientists. Simple models are presented, and previous knowledge of biology is not required for understanding the book. All the essential biological background is given in the text, while basic mathematical knowledge is sufficient for reading a large part of the book.

In each chapter, the material is organized in increasing order of complexity followed by exercises. Some of the exercises deal with the material of that chapter, while others are projects that extend the preceding material. Many chapters contain sections with suggestions for computing projects. Simulations are done in Matlab and computer code is included in the text.

There are two major parts of the text. The first part deals with models from physiology, while the second part deals with models from population biology. In Chapter One, the authors derive models of blood flow and pressure, and mechanisms for controlling them. They describe a model of uncontrolled circulation, the baroreceptor loop, as neural control of circulation, and autoregulation. At the end of the chapter, they consider the dynamics of the arterial pulse, with nonconstant pressure, flow and volume in time.

Gas exchange in the lungs is described in Chapter Two. Equations of gas transport in one alveolus are derived from the ideal gas law. They are used to describe gas transport in the lung. Chapter Three deals with control of cell volume. Based on osmotic effects and neglecting all electrical effects, a simple model of cell volume control is derived. By introducing electrical effects, a more complex model is obtained. A special section covers the Hodgkin-Huxley equation for the nerve action potential. Chapter Four describes the renal mechanism. Here the dynamics of sodium ions and water in nephrons are modeled. Muscle mechanics is explained by a force-velocity curve and crossbridge dynamics in Chapter Five. Chapter Six deals with neural systems and the main topic is a model of a neural network. Population dynamics is considered in Chapter Seven. Bacterial cultures are used to illustrate a simple model of exponential growth. In a more complex example of age structures, Euler's renewal theory is presented, and in an example of microbial ecology, more complex continuous models of population growth are presented. Nonlinear reproduction curves and controlling populations are other topics in this chapter. There are two topics from genetics in Chapter Eight: population genetics and an application of mathematics in biotechnology.

Epidemic models are described in Chapter Nine. The authors present the spread of an infection within a family, the threshold of an epidemic and prediction of the severity of an epidemic. In the last chapter, they describe modeling of patterns of population growth.

Reviewer: Marusic, Miljenko (CT-ZAGR)

Review Type: Signed review

Descriptors: *92-01 -Biology and other natural sciences-Instructional exposition (textbooks, tutorial papers, etc.) ; 92B05 -Biology and other natural sciences-Mathematical biology in general-General biology and biomathematics; 92C30 -Biology and other natural sciences-Physiological, cellular and medical topics-Physiology (general); 92D10 -Biology and other

natural sciences-Genetics and population dynamics-Genetics (For genetic algebras, see 17D92); 92D25 -Biology and other natural sciences-Genetics and population dynamics-Population dynamics (general)

1/5/218 (Item 8 from file: 239)
DIALOG(R)File 239:Mathsci

03230815 MR 2002a#92004
Mathematical models and simulations of bacterial growth and chemotaxis in a diffusion gradient chamber.
Chiu, Chichia (Department of Mathematics, Michigan State University, East Lansing, Michigan, 48824)
Hoppensteadt, Frank C. (Center for Systems Science and Engineering, Arizona State University, Tempe, Arizona, 85287
Corporate Source Codes: 1-MIS; 1-AZS-CSY
J. Math. Biol.
Journal of Mathematical Biology, 2001, 42, no. 2, 120--144. ISSN: 0303-6812 CODEN: JMBLAJ
Language: English Summary Language: English
Document Type: Journal
Journal Announcement: 200110
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (15 lines)
Summary: ``The diffusion gradient chamber (DGC) is a novel device developed to study the response of chemotactic bacteria to combinations of nutrients and attractants [D. Emerson, R. M. Worden and J. A. Breznak, Appl. Environ. Microbiol. 60 (1994), no. 4, 1269]. Its purpose is to characterize genetic variants that occur in many biological experiments. In this paper, a mathematical model which describes the spatial distribution of a bacterial population within the DGC is developed. We give a mathematical analysis of the model concerning positivity and boundedness of the solutions. An alternating direction implicit method is constructed for finding numerical solutions of the model and carrying out computer simulations. The numerical results of the model successfully reproduce the patterns that are observed in the experiments using the DGC.''
Reviewer: Summary
Review Type: Abstract
Descriptors: *92C17 -Biology and other natural sciences-Physiological, cellular and medical topics-Cell movement (chemotaxis, etc.) ; 92D25 -Biology and other natural sciences-Genetics and population dynamics-Population dynamics (general)

1/5/219 (Item 9 from file: 239)
DIALOG(R)File 239:Mathsci

03220915 MR 2001m#68148
Synchronization of MEMS resonators and mechanical neurocomputing.
Hoppensteadt, Frank C. (Center for Systems Science and Engineering, Arizona State University, Tempe, Arizona, 85287)
Izhikevich, Eugene M
(Izhikevich, E. M.)
Corporate Source Codes: 1-AZS-CSY
IEEE Trans. Circuits Systems I Fund. Theory Appl.
IEEE Transactions on Circuits and Systems. I. Fundamental Theory and Applications, 2001, 48, no. 2, 133--138. ISSN: 1057-7122 CODEN: ITCAEX
Language: English Summary Language: English
Document Type: Journal
Journal Announcement: 200110
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (13 lines)
Summary: ``We combine here two well-known and established concepts: microelectromechanical systems (MEMS) and neurocomputing. First, we

consider MEMS oscillators having low amplitude activity and we derive a simple mathematical model that describes nonlinear phase-locking dynamics in them. Then we investigate the theoretical possibility of using MEMS oscillators to build an oscillatory neurocomputer having autocorrelative associative memory. The neurocomputer stores and retrieves complex oscillatory patterns in the form of synchronized states with appropriate phase relations between the oscillators. Thus, we show that MEMS alone can be used to build a sophisticated information processing system (U.S. provisional patent 60/178,654).''
Reviewer: Fabris, Francesco (I-UDIN)
Review Type: Signed review
Descriptors: *68T05 -Computer science (For papers involving machine computations and programs in a specific mathematical area, see Section --04 in that area)-Artificial intelligence-Learning and adaptive systems (See also 68Q32, 91E40) ; 68T10 -Computer science (For papers involving machine computations and programs in a specific mathematical area, see Section --04 in that area)-Artificial intelligence-Pattern recognition, speech recognition (For cluster analysis, see 62H30); 82C32 -Statistical mechanics, structure of matter-Time-dependent statistical mechanics (dynamic and nonequilibrium)-Neural nets (See also 68T05, 91E40, 92B20); 94A08 -Information and communication, circuits-Communication, information-Image processing (compression, reconstruction, etc.) (See also 68U10)

1/5/220 (Item 10 from file: 239)
DIALOG(R)File 239:Mathsci

03174642 MR 2001h#37001
Analysis and simulation of chaotic systems.
Second edition.
Hoppensteadt, Frank C. (Center for Systems Science and Engineering, Arizona State University, Tempe, Arizona, 85287
Corporate Source Codes: 1-AZS-CSY
Publ: Springer-Verlag, New York,
2000, xx+315 pp. ISBN: 0-387-98943-9
Series: Applied Mathematical Sciences, 94.
Price: $69.95.
Language: English Summary Language: English
Document Type: Book
Journal Announcement: 200007
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: SHORT (2 lines)
The first edition of this book has been reviewed [MR 94a:34003].
Reviewer: Editors
Review Type: Abstract
Descriptors: *37-01 -Dynamical systems and ergodic theory (See also 26A18, 28Dxx, 34Cxx, 34Dxx, 35Bxx, 46Lxx, 58Jxx, 70-XX)-Instructional exposition (textbooks, tutorial papers, etc.) ; 00A69 -General-General and miscellaneous specific topics-General applied mathematics (For physics, see 00A79 and Sections 70 through 86); 34C28 -Ordinary differential equations-Qualitative theory (See also 37-XX)-Complex behavior, chaotic systems (See mainly 37Dxx); 37D45 -Dynamical systems and ergodic theory (See also 26A18, 28Dxx, 34Cxx, 34Dxx, 35Bxx, 46Lxx, 58Jxx, 70-XX)-Dynamical systems with hyperbolic behavior-Strange attractors, chaotic dynamics; 37M05 -Dynamical systems and ergodic theory (See also 26A18, 28Dxx, 34Cxx, 34Dxx, 35Bxx, 46Lxx, 58Jxx, 70-XX)-Approximation methods and numerical treatment of dynamical systems (See also 65Pxx)-Simulation; 65P20 -Numerical analysis-Numerical problems in dynamical systems (See also 37Mxx)-Numerical chaos

1/5/221 (Item 11 from file: 239)
DIALOG(R)File 239:Mathsci

02865737 MR 99a#92005

An introduction to the mathematics of neurons.
Modeling in the frequency domain. Second edition.

Hoppensteadt, Frank C. (Department of Mathematics, Arizona State University, Tempe, Arizona, 85287
Corporate Source Codes: 1-AZS

Publ: Cambridge University Press, Cambridge,
1997, xx+211 pp. ISBN: 0-521-59075-2; 0-521-59929-6
Series: Cambridge Studies in Mathematical Biology, 14.
Price: $59.95; $22.95 paperbound.
Language: English Summary Language: English
Document Type: Book
Journal Announcement: 9802
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (62 lines)

The subtitle of this book, ``Modeling in the frequency domain'', reflects its focus on a neuronal model called ``VCON'', or ``voltage controlled oscillator neuron'', based on an analogy between neurons and phase-locked loops of voltage-controlled oscillators in electronic circuits. Informally, the idea is that the neuronal axon hillock generates action potentials of relatively constant waveform; what varies depending on inputs to the neuron is the timing of the action potential. Therefore the output can be written $V(\phi(t))$, where $V(\cdot)$ is a fixed function (the waveform), and $\phi(t)$ is the phase. Modeling of a neuronal network is said to be in the ``frequency domain'' if the dynamics of the network can be expressed in terms of differential equations with the phases as the variables. Phase-locking behavior is sought, i.e. conditions under which the neurons in a network tend toward constant phase differences in the course of time. The analogy is an interesting and fruitful one.

The book begins with a review of electrical circuits, focusing on voltage-controlled oscillators (VCOs), where the time derivative of the output phase is a linear function of the input voltage. A phase-locked loop consists of a phase detector, a low-pass filter and a VCO in series, with feedback from the output of the VCO to the phase detector. After a review of other models of neuronal firing, including the Hodgkin-Huxley ion channel model, the VCO-VCON analogy is developed. A chemical synapse can be modeled as a low-pass filter, obeying the relationship $\tau \dot{X}+X=S\sb X$, where X is the postsynaptic potential and τ is the reciprocal of the sum of the diffusion and postsynaptic binding constants for the neurotransmitter, replacing the time constant RC of a resistive-capacitative filter. $S\sb X$ represents the source of the neurotransmitter, and is proportional to $\dot{\phi}$, where ϕ is the input phase, since the time derivative of the input phase is related to the rate of arrival of presynaptic impulses. Electrical synapses can be similarly modeled. The phase detector of the VCO is replaced by a mixer that combines the postsynaptic potentials with the cell's current state. The mixing function is typically sigmoidal. VCONs may have multiple stable states, and can also undergo a saddle-node bifurcation in which the relative output phase no longer tends to a constant, but increases without bound, as the neuron fires repetitively. This bifurcation process is discussed in more mathematical detail in another recent book by the author and E. M. Izhikevich [Weakly connected neural networks, Springer, New York, 1997; MR 98k:92004].

In later chapters many applications of the VCON model to small and large neuronal networks are given. Small networks include, for example, the ``atoll model'', in which an excitatory and an inhibitory cell interact in such a way that a burst in one cell is followed by a slow pulse in the other. The atoll oscillator model is later applied on a larger scale, to control of attention, through a model involving excitatory cells in the thalamus interacting with inhibitory cells in the thalamic reticular complex. Applications to central pattern generators such as the controller of the gastric mill in crustacea, flight in moths, respiration, and binaural sound location are given. Larger neuronal networks are analyzed through continuum approximations, and also discussed in terms of ``mnemonic surfaces'', energy-like functions whose minima correspond to stable choices for the relative phases of neurons in the network, and are capable of encoding information.

Reviewer: Matthysse, Steven (Belmont, MA)

Review Type: Signed review
Descriptors: *92C20 -Biology and other natural sciences, behavioral sciences-Physiological, cellular and medical topics-Neural biology ; 92B20 -Biology and other natural sciences, behavioral sciences-Mathematical biology in general-Neural networks (See also 68T05, 82C32, 94Cxx)

1/5/222 (Item 12 from file: 239)
DIALOG(R)File 239:Mathsci

02852024 MR 98m#60106
On the asymptotic behavior of Markov chains with small random perturbations of transition probabilities.
Multidimensional statistical analysis and theory of random matrices (Bowling Green, OH, 1996)
Hoppensteadt, F. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Salehi, H. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Skorokhod, A. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824
(Salehi, Habib)
Corporate Source Codes: 1-MIS-S; 1-MIS-S; 1-MIS-S
1996,
VSP, Utrecht,; 93--100,,
Language: English Summary Language: English
Document Type: Proceedings Paper
Journal Announcement: 9716
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (13 lines)
The asymptotic behavior of Markov chains with small perturbations of the n-step transition probabilities as follows is considered: $P\sp {*}\sb n (\epsilon) =P+ \epsilon Q\sp {*}\sb n$, where P is a transition matrix and $Q\sp {*}\sb n$ is an ergodic stationary matrix-valued process, and ϵ is a small parameter. It is proved that the n-steps transition matrix of the Markov chain above converges to a nonrandom matrix with probability 1 under some general conditions as n goes to infinitity and ϵ goes to 0. The result above is applied to the evolutionary path of bacteria. Similar considerations in more detail can be found in another paper by the authors [Random Oper. Stochastic Equations 4 (1996), no. 3, 205--227; MR 97j:60127].
\{For the entire collection see MR 98b:62002.\}
Reviewer: Qian, Min Ping (PRC-BJ)
Review Type: Signed review
Proceedings Reference: 98b#62002; 1 463 452
Descriptors: *60J10 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Markov processes-Markov chains with discrete parameter ; 60J20 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Markov processes-Applications of discrete Markov processes (social mobility, learning theory, industrial processes, etc.) (See also 90B30, 92H10, 92H35, 92J40); 92D10 -Biology and other natural sciences, behavioral sciences-Genetics and population dynamics-Genetics (For genetic algebras, see 17D92)

1/5/223 (Item 13 from file: 239)
DIALOG(R)File 239:Mathsci

02845266 MR 98k#92004
Weakly connected neural networks.
Hoppensteadt, Frank C. (Center for Systems Science and Engineering, Arizona State University, Tempe, Arizona, 85287)
Izhikevich, Eugene M. (Center for Systems Science and Engineering,

Arizona State University, Tempe, Arizona, 85287
(Izhikevich, E. M.)
Corporate Source Codes: 1-AZS-CSY; 1-AZS-CSY
Publ: Springer-Verlag, New York,
1997, xvi+400 pp. ISBN: 0-387-94948-8
Series: Applied Mathematical Sciences, 126.
Price: $49.95.
Language: English Summary Language: English
Document Type: Book
Journal Announcement: 9715
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (49 lines)

The book under review is devoted to an analysis of general continuous, weakly connected neural networks of the form (1) $\dot x\sb i=f\sb i(x\sb i)+\epsilon g\sb i(x\sb 1,\cdots,x\sb n,\epsilon)$. Here $x\sb i$ are neural activity vectors, $x\sb i\in \bold R\sp m$ of n neurons, $i=1,\cdots,n$; $f\sb i$ describes the dynamics of the ith neuron, and $g\sb i$ describes interactions between neurons. The small parameter ϵ indicates the strength of synaptic connections. The method used is that of treating (1) as an ϵ-perturbation of the uncoupled system with $\epsilon=0$. Then a bifurcation analysis is performed in detail for two appropriate models which fulfill the conditions of (1), namely the additive neural network model with a sigmoidal transfer function and the Wilson-Cowan model for the pair of excitatory and inhibitory neurons, creating a neural oscillator. In the book only limit cycles of weakly connected networks of resting neurons---equilibrium points, and periodically spiking neurons---are analyzed. As the authors say in the nicely written preface: ``While it is feasible to study weakly connected networks of chaotic neurons, this problem goes beyond the scope of this book.''

After the introduction, written according to the authors in ordinary language, and well readable even for laymen, follows a nicely written Chapter 2 on bifurcations in neuron dynamics which must be read. Here also spiking and bursting phenomena are clearly described. Chapter 3 contains a short sketch of nonhyperbolic (when the Jacobian matrix of (1) has at least one eigenvalue with zero real part) neural networks. The remaining part of the book is mainly devoted to canonical models (Chapter 4), their derivation (Chapters 6--9), and their analysis (Chapters 10--12). The term canonical model is not precisely defined here. The authors say that a model is canonical if there is a continuous change of variables that transforms any other model from a given class into this one. As the method of deriving the canonical models, the authors exploit the normal form theory. Canonical models treated in the book have only restricted value: They provide information about local behavior of (1) when there is an exponentially stable limit cycle but they say nothing about global behavior of (1), including the transients. The last Chapter 13 describes the relationship between synaptic organizations and dynamical properties of networks of neural oscillators. In other words, the problem of learning and memorization of phase information in the weakly connected network of oscillators corresponding to multiple Andronov-Hopf bifurcation is treated analytically.

Surprisingly the book ends without any conclusions. Also there are no appendices to the book. The references are representative and sufficiently cover the problematics treated in the book.

Reviewer: Andrey, Ladislav (Prague)
Review Type: Signed review
Descriptors: *92B20 -Biology and other natural sciences, behavioral sciences-Mathematical biology in general-Neural networks (See also 68T05, 82C32, 94Cxx) ; 34C99 -Ordinary differential equations-Qualitative theory (See also 58Fxx)-None of the above, but in this section; 58F40 -Global analysis, analysis on manifolds (See also 32Cxx, 32Fxx, 46-XX, 47Hxx, 53Cxx; for geometric integration theory, see 49Q15)-Ordinary differential equations on manifolds; dynamical systems (See also 28D10, 34Cxx, 54H20)-Applications; 92-02 -Biology and other natural sciences, behavioral sciences-Research exposition (monographs, survey articles)

1/5/224 (Item 14 from file: 239)
DIALOG(R)File 239:Mathsci

02843620 MR 98k#60155
Discrete time semigroup transformations with random perturbations.
Hoppensteadt, F. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Salehi, H. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Skorokhod, A. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824
(Salehi, Habib)
Corporate Source Codes: 1-MIS-S; 1-MIS-S; 1-MIS-S
J. Dynam. Differential Equations
Journal of Dynamics and Differential Equations, 1997, 9, no. 3, 463--505. ISSN: 1040-7294 CODEN: JDDEEH
Language: English Summary Language: English
Document Type: Journal
Journal Announcement: 9716
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (18 lines)
In this paper the authors consider a system in a linear phase space X with discrete time $n\in\bold Z\sb +$, which is perturbed by a random process $\{y\sb n,\ n\in\bold Z\sb +\}$ defined on a measurable space $(Y,\scr C)$. The system depends on a small positive parameter ϵ. The state of the system at time n, $x\sp \epsilon\sb n\in X$, is determined by the recurrence relations $x\sp \epsilon\sb {n+1}=f(x\sp \epsilon\sb n)+\epsilon\phi(x\sp \epsilon\sb n,y\sb {n+1})$, for $n\geq 0$, $x\sp \epsilon\sb 0=x\sb 0$, where $x\sb 0$ is given, $f\colon X\to X$ is a continuous function and $\phi\colon X\times Y\to X$ is a function which is continuous in x and measurable in y. The system is studied in the following phase spaces: (1) X a separable Banach space; (2) X a separable Hilbert space; (3) $X=\bold R\sp d$. The authors investigate the asymptotic behavior of the system as $\epsilon\to 0$ and $n\to\infty$, and give applications of the results obtained to epidemics, to genetics and to demography.
Reviewer: Simao, Isabel (P-LISBS)
Review Type: Signed review
Descriptors: *60J99 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Markov processes-None of the above, but in this section

1/5/225 (Item 15 from file: 239)
DIALOG(R)File 239:Mathsci

02772544 CMP 1 478 298
Wave propagation in mathematical models of striated cortex.
Hoppensteadt, F. C. (Center for Systems Science and Engineering, Arizona State University, Tempe, Arizona, 85287)
Mittelmann, H. D. (Center for Systems Science and Engineering, Arizona State University, Tempe, Arizona, 85287
Corporate Source Codes: 1-AZS-CSY; 1-AZS-CSY
J. Math. Biol.
Journal of Mathematical Biology, 1997, 35, no. 8, 988--994. ISSN: 0303-6812 CODEN: JMBLAJ
Language: English
Document Type: Journal
Journal Announcement: 9803
Subfile: CMP (Current Mathematical Publications) AMS
Review Type: No review planned
Descriptors: *92C20 -Biology and other natural sciences, behavioral sciences-Physiological, cellular and medical topics-Neural biology ; 92-04 -Biology and other natural sciences, behavioral sciences-Explicit machine

computation and programs (not the theory of computation or programming)

1/5/226 (Item 16 from file: 239)
DIALOG(R)File 239:Mathsci

02767633 CMP 1 473 463
An introduction to the mathematics of neurons.
Modeling in the frequency domain. Second edition.
Hoppensteadt, Frank C. (Department of Mathematics, Arizona State University, Tempe, Arizona, 85287
Corporate Source Codes: 1-AZS
Publ: Cambridge University Press, Cambridge,
1997, xx+211 pp. ISBN: 0-521-59075-2; 0-521-59929-6
Series: Cambridge Studies in Mathematical Biology, 14.
Price: $59.95; $22.95 paperbound.
Language: English Summary Language: English
Document Type: Book
Journal Announcement: 9802
Subfile: CMP (Current Mathematical Publications) AMS
Review Type: Review pending
Descriptors: *92Cxx -Biology and other natural sciences, behavioral sciences-Physiological, cellular and medical topics ; 92-01 -Biology and other natural sciences, behavioral sciences-Instructional exposition (textbooks, tutorial papers, etc.)

1/5/227 (Item 17 from file: 239)
DIALOG(R)File 239:Mathsci

02745908 CMP 1 464 083
Discrete time semigroup transformations with random perturbations.
Hoppensteadt, F. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Salehi, H. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Skorokhod, A. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824
(Salehi, Habib)
Corporate Source Codes: 1-MIS-S; 1-MIS-S; 1-MIS-S
J. Dynam. Differential Equations
Journal of Dynamics and Differential Equations, 1997, 9, no. 3, 463--505. ISSN: 1040-7294 CODEN: JDDEEH
Language: English Summary Language: English
Document Type; Journal
Journal Announcement: 9716
Subfile: CMP (Current Mathematical Publications) AMS
Review Type: Review pending
Descriptors: *60H15 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Stochastic analysis (See also 58G32)-Stochastic partial differential equations (See also 35R60) ; 39A99 -Finite differences and functional equations-Difference equations (For dynamical systems, see 58Fxx)-None of the above, but in this section; 60J99 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Markov processes-None of the above, but in this section

1/5/228 (Item 18 from file: 239)
DIALOG(R)File 239:Mathsci

02745283 CMP 1 463 458
On the asymptotic behavior of Markov chains with small random

perturbations of transition probabilities.
Multidimensional statistical analysis and theory of random matrices (Bowling Green, OH, 1996)

Hoppensteadt, F. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Salehi, H. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Skorokhod, A. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824
(Salehi, Habib)
Corporate Source Codes: 1-MIS-S; 1-MIS-S; 1-MIS-S

1996,
VSP, Utrecht,;   93--100,,
Language: English   Summary Language: English
Document Type: Proceedings Paper
Journal Announcement: 9716
Subfile: CMP (Current Mathematical Publications) AMS
Review Type: Review pending
Proceedings Reference: ; 1 463 452
Descriptors: *60Jxx -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Markov processes

1/5/229   (Item 19 from file: 239)
DIALOG(R)File 239:Mathsci

02740683 CMP 1 458 890
Weakly connected neural networks.

Hoppensteadt, Frank C. (Center for Systems Science and Engineering, Arizona State University, Tempe, Arizona, 85287)
Izhikevich, Eugene M. (Center for Systems Science and Engineering, Arizona State University, Tempe, Arizona, 85287
(Izhikevich, E. M.)
Corporate Source Codes: 1-AZS-CSY; 1-AZS-CSY

Publ: Springer-Verlag, New York,
1997, xvi+400 pp. ISBN: 0-387-94948-8
Series: Applied Mathematical Sciences, 126.
Price: $49.95.
Language: English   Summary Language: English
Document Type: Book
Journal Announcement: 9715
Subfile: CMP (Current Mathematical Publications) AMS
Review Type: Review pending
Descriptors: *92B20 -Biology and other natural sciences, behavioral sciences-Mathematical biology in general-Neural networks (See also 68T05, 82C32, 94Cxx) ; 34Cxx -Ordinary differential equations-Qualitative theory (See also 58Fxx); 34Dxx -Ordinary differential equations-Stability theory (See also 58F10, 93Dxx); 58Fxx -Global analysis, analysis on manifolds (See also 32Cxx, 32Fxx, 46-XX, 47Hxx, 53Cxx; for geometric integration theory, see 49Q15)-Ordinary differential equations on manifolds; dynamical systems (See also 28D10, 34Cxx, 54H20); 92-02 -Biology and other natural sciences, behavioral sciences-Research exposition (monographs, survey articles)

1/5/230   (Item 20 from file: 239)
DIALOG(R)File 239:Mathsci

02737746 MR 97m#60095
Randomly perturbed Volterra integral equations and some applications.

Hoppensteadt, F. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Salehi, H. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)

Skorokhod, A. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824
(Salehi, Habib)
Corporate Source Codes: 1-MIS-S; 1-MIS-S; 1-MIS-S
Stochastics Stochastics Rep.
Stochastics and Stochastics Reports, 1995, 54, no. 1-2, 89--125.
ISSN: 1045-1129 CODEN: STOCBS
Language: English Summary Language: English
Document Type: Journal
Journal Announcement: 9610
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (37 lines)
The authors consider the equations $$x\sb \epsilon(t)=\phi(t)+\int\sp t\sb 0k\bigg(t,s,y\bigg(\frac s\epsilon\bigg)(s)\bigg)ds\quad{\rm and}\tag 1$$ $$\overline x(t)=\phi(t)+\int\sp t\sb 0\overline k(s,t,\overline x(t))ds,\tag 2$$ where $y(s)$ is an ergodic stationary process, or a stationary ergodic Markov process. Let $\rho(dy)$ denote the ergodic distribution of $y(t)$ and let $\overline k(s,t,x)=\int k(s,t,y,x)\rho(dy)$. First they find sufficient conditions for the convergence of $x\sb \epsilon(t)$ to $\overline x(t)$ when $\epsilon\to 0$, more precisely, for the relation $P\{\lim\sb {\epsilon\to 0}\sup\sb {t\leq T}\Vert x\sb \epsilon(t)-\overline x(t)\Vert =0\}=1$ to be true for all $T>0$. They also show that, under some smoothness conditions on the kernel with respect to x, the solution $x\sb \epsilon(t)$ of (1), with $\phi(t)=x\sb 0$, converges weakly, when $\epsilon\to 0$, to a process $x(t)$ which satisfies the stochastic integral equation (3) $x(t)=x\sb 0+\int\sp t\sb 0x(s)dw(s)$. In (1), $w(t)$ is an $L(\bold R\sp d)$-valued Wiener process for which $Ew(t)=0$ and the covariance is expressed by means of $\rho(dy)$ and $k(y)=\lim\sb {s,t\to\infty, t-s\to\infty}k(s,t,y)$. As techniques, the authors show that $x(t)$ may be represented by a series of multiple stochastic integrals, $$x(t)=\phi(t)+\sum\sp \infty\sb {n=1}\int\sb {0<s\sb 1<\cdots<s\sb n<t}d\sb {s\sb n}w(s\sb n,t), \cdots,d\sb {s\sb 1}w(s\sb 1,s\sb 2)\phi(s\sb 1),$$ where $\phi(t)$ and $x(t)$ are $\bold R\sp d$-valued processes for all $t\in\bold R\sb +$, and $w(s,t)$ is an $L(\bold R\sp d)$-valued Wiener process in s, on the interval $[0,t]$. The authors treat particularly interesting problems that arise for integral equations $$x\sb \epsilon(t)=\phi(t)+\int\sp t\sb 0M\bigg(t-s,y\bigg({s\over\epsilon}\bigg),x\sb \epsilon(s)\bigg)ds\tag4$$ of convolution type. These equations are treated by introducing Laplace transform techniques. The authors also discuss the applications of these perturbed Volterra equations in a number of domains: epidemics, demographics and electrical engineering. This is an interesting and valuable paper in both the theoretical and applied fields.
Reviewer: Lewin, Marica (IL-TECH)
Review Type: Signed review
Descriptors: *60H20 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Stochastic analysis (See also 58G32)-Stochastic integral equations ; 45D05 -Integral equations-Volterra integral equations (See also 34A12); 60J99 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Markov processes-None of the above, but in this section

1/5/231 (Item 21 from file: 239)
DIALOG(R)File 239:Mathsci

02717695 MR 97j#60127
Markov chain with small random perturbations with applications to bacterial genetics.
Hoppensteadt, F. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Salehi, H. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Skorokhod, A. (Department of Statistics and Probability, Michigan State

University, East Lansing, Michigan, 48824
(Salehi, Habib)
Corporate Source Codes: 1-MIS-S; 1-MIS-S; 1-MIS-S
Random Oper. Stochastic Equations
Random Operators and Stochastic Equations, 1996, 4, no. 3, 205--227. ISSN: 0926-6364
Language: English Summary Language: English
Document Type: Journal
Journal Announcement: 9703
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (16 lines)
The convergence of the Cesaro averages of n-step transition probabilities is proved for finite Markov chains in random environments with the following n-step transition probability matrix: $P\sp {*}\sb n (\epsilon) =P+\epsilon Q\sp {*}\sb n$, where P is a transition matrix and the entries of $P\sp {*}\sb n(\epsilon)$ are stationary ergodic sequences and, as ϵ goes to zero, the limit distribution goes to the ergodic limit distribution of the homogeneous Markov chain with the transition matrix of the the mean of $P\sp {*}\sb n(\epsilon)$. The result above is applied to the evolutionary path of bacteria, i.e., to define and to express the fitness of a chromosome evolving in a random enviroment in terms that are observable in experiments. About the products of random matrices readers may also refer to J. E. Cohen [Bull. Amer. Math. Soc. (N.S.) 1 (1979), no. 2, 275--295; MR 81j:92029].
Reviewer: Qian, Min Ping (PRC-BJ)
Review Type: Signed review
Descriptors: *60J10 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Markov processes-Markov chains with discrete parameter ; 60J20 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Markov processes-Applications of discrete Markov processes (social mobility, learning theory, industrial processes, etc.) (See also 90B30, 92H10, 92H35, 92J40); 92D10 -Biology and other natural sciences, behavioral sciences-Genetics and population dynamics-Genetics (For genetic algebras, see 17D92)

1/5/232 (Item 22 from file: 239)
DIALOG(R)File 239:Mathsci

02660444 CMP 1 414 875
Markov chain with small random perturbations with applications to bacterial genetics.
Hoppensteadt, F. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Salehi, H. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Skorokhod, A. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824
(Salehi, Habib)
Corporate Source Codes: 1-MIS-S; 1-MIS-S; 1-MIS-S
Random Oper. Stochastic Equations
Random Operators and Stochastic Equations, 1996, 4, no. 3, 205--227. ISSN: 0926-6364
Language: English Summary Language: English
Document Type: Journal
Journal Announcement: 9703
Subfile: CMP (Current Mathematical Publications) AMS
Review Type: Review pending
Descriptors: *60Jxx -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Markov processes ; 92-XX -Biology and other natural sciences, behavioral sciences

1/5/233 (Item 23 from file: 239)
DIALOG(R)File 239:Mathsci

02654838 MR 97c#60152

An averaging principle for dynamical systems in Hilbert space with Markov random perturbations.

Hoppensteadt, F. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Salehi, H. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Skorokhod, A. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824
(Salehi, Habib)
Corporate Source Codes: 1-MIS-S; 1-MIS-S; 1-MIS-S

Stochastic Process. Appl.
Stochastic Processes and their Applications, 1996, 61, no. 1, 85--108. ISSN: 0304-4149 CODEN: STOPB7
Language: English Summary Language: English
Document Type: Journal
Journal Announcement: 9609
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (24 lines)

A typical result of this paper is the theorem on the averaging principle for stochastic differential equations of jump type in Hilbert space. Consider the solution $x\sb \epsilon(t)$ of the differential equations $dx\sb \epsilon(t)/dt=A(y(t/\epsilon))x\sb \epsilon(t)$, $x\sb \epsilon(0)=x\sb 0$, $0<\epsilon\ll 1$, where $A(y)$, for y in a space Y, is a family of operators forming the generators of semigroups of bounded linear operators in a Hilbert space H, and $y(t)$ is an ergodic jump Markov process in Y with its ergodic probability distribution $\rho(dy)$. Further, let $\overline x(t)$ be the solution of the equation $d\overline{x}(t)/dt=\overline{A}\overline{x}(t)$, $\overline{x}(0)=x\sb 0$, where $\overline A=\int A(y)\rho(dy)$. Then the authors find conditions under which $x\sb \epsilon(t)\to\overline{x}(t)$ in probability uniformly on all finite intervals as $\epsilon\to 0$, and they also prove that, under some additional conditions, $\epsilon\sp {-1/2}(x\sb \epsilon(t)-\overline{x}(t))$ converges weakly in distribution as $\epsilon\to 0$ to a Gaussian process $\tilde x(t)$ with independent increments in t for which the limiting distribution is obtained. They give applications of these results to partial differential equations with random perturbations and take examples arising in various fields, such as bacterial growth, random advection and diffusion in random media.
Reviewer: Narita, Kiyomasa (J-KANAG)
Review Type: Signed review

Descriptors: *60H10 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Stochastic analysis (See also 58G32)-Stochastic ordinary differential equations (See also 34F05) ; 34F05 - Ordinary differential equations-Equations and systems with randomness (See also 34K50, 60H10, 93E03)

1/5/234 (Item 24 from file: 239)
DIALOG(R)File 239:Mathsci

02605213 CMP 1 382 280

Randomly perturbed Volterra integral equations and some applications.

Hoppensteadt, F. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Salehi, H. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Skorokhod, A. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824
(Salehi, Habib)
Corporate Source Codes: 1-MIS-S; 1-MIS-S; 1-MIS-S

Stochastics Stochastics Rep.
Stochastics and Stochastics Reports, 1995, 54, no. 1-2, 89--125.
ISSN: 1045-1129 CODEN: STOCBS
Language: English Summary Language: English
Document Type: Journal
Journal Announcement: 9610
Subfile: CMP (Current Mathematical Publications) AMS
Review Type: Review pending
Descriptors: *60H15 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Stochastic analysis (See also 58G32)-Stochastic partial differential equations (See also 35R60) ; 49Mxx -Calculus of variations and optimal control; optimization (See also 34H05, 65Kxx, 90Cxx, 93-XX)-Methods of successive approximations (For discrete problems, see 90Cxx; see also 65Kxx); 60J99 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Markov processes-None of the above, but in this section

1/5/235 (Item 25 from file: 239)
DIALOG(R)File 239:Mathsci

02598062 CIS 9409503
Review of ``Mathematics in medicine and the life sciences''
Hoppensteadt, F. C.
Peskin, C. S.
Ststcian (CIS abbrev)
The Statistician, 1994, 43, 211-211
Language: English Summary Language: English Review
Document Type: Book Review
Subfile: CIS (Current Index to Statistics) ASA/IMS

1/5/236 (Item 26 from file: 239)
DIALOG(R)File 239:Mathsci

02591842 CIS 9400360
Mathematics in medicine and the life sciences
Hoppensteadt, F. C.
Peskin, C. S.
Publ: Springer-Verlag Inc, Berlin, FRGermany and New York, NY
1992, 252 pages
Language: English
Document Type: Book
Subfile: CIS (Current Index to Statistics) ASA/IMS

1/5/237 (Item 27 from file: 239)
DIALOG(R)File 239:Mathsci

02589775 CMP 1 378 850
An averaging principle for dynamical systems in Hilbert space with Markov random perturbations.
Hoppensteadt, F. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Salehi, H. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Skorokhod, A. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824
(Salehi, Habib)
Corporate Source Codes: 1-MIS-S; 1-MIS-S; 1-MIS-S
Stochastic Process. Appl.
Stochastic Processes and their Applications, 1996, 61, no. 1,

85--108. ISSN: 0304-4149 CODEN: STOPB7
Language: English Summary Language: English
Document Type: Journal
Journal Announcement: 9609
Subfile: CMP (Current Mathematical Publications) AMS
Review Type: Review Pending
Descriptors: *60H10 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Stochastic analysis (See also 58G32)-Stochastic ordinary differential equations (See also 34F05) ; 34C29 -Ordinary differential equations-Qualitative theory (See also 58Fxx)-Averaging method; 34F05 -Ordinary differential equations-Equations and systems with randomness (See also 34K50, 60H10, 93E03); 34Gxx -Ordinary differential equations-Differential equations in abstract spaces (See also 58D25); 35Rxx -Partial differential equations-Miscellaneous topics involving partial differential equations (For equations on manifolds, see 58Gxx; for manifolds of solutions, see 58Bxx; for stochastic PDEs, see also 60H15)

1/5/238 (Item 28 from file: 239)
DIALOG(R)File 239:Mathsci

02540572 MR 96a#34116
Singular perturbation solutions of noisy systems.
Perturbation methods in physical mathematics (Troy, NY, 1993).
Hoppensteadt, Frank C. (Department of Mathematics, Michigan State University, East Lansing, Michigan, 48824
Corporate Source Codes: 1-MIS
SIAM J. Appl. Math.
SIAM Journal on Applied Mathematics, 1995, 55, no. 2, 544--551.
ISSN: 0036-1399 CODEN: SMJMAP
Language: English Summary Language: English
Document Type: Journal
Journal Announcement: 9509
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (20 lines)
In this paper the author gives a brief survey of recently obtained results of his and coauthors [F. C. Hoppensteadt, Analysis and simulation of chaotic systems, Springer, New York, 1993; MR 94a:34003; F. C. Hoppensteadt, R. Z. Khasminskii and H. Salehi, Random Oper. Stochastic Equations 2 (1994), no. 1, 61--78; MR 95d:35189; F. C. Hoppensteadt, H. Salehi and A. V. Skorokhod, ``An averaging principle for dynamical systems in Hilbert space with Markov random perturbations'', Stochastic Process. Appl., to appear; F. C. Hoppensteadt, H. Salehi and A. V. Skorokhod, ``Randomly perturbed Volterra integral equations and some applications'', Stochastics Stochastics Rep., to appear]. He describes recent work on singular perturbation solutions that persist in the presence of noise in two different settings: one is the small deviation theory in quasi-static problems where there are small-amplitude but highly irregular perturbations, and the other is that of averaging problems where there are ergodic stochastic perturbations. He states that his new methods can be applicable to topics, such as Lorenz's equations, controls, diffusions in randomly fluctuating media and epidemic models.
\{For the entire collection see MR 95j:00015\}.
Reviewer: Narita, Kiyomasa (J-KANAG)
Review Type: Signed review
Proceedings Reference: 95j#00015; 1 322 760
Descriptors: *34E15 -Ordinary differential equations-Asymptotic theory-Singular perturbations, general theory ; 34C29 -Ordinary differential equations-Qualitative theory (See also 58Fxx)-Averaging method; 34F05 -Ordinary differential equations-Equations and systems with randomness (See also 34K50, 60H10, 93E03); 35R60 -Partial differential equations-Miscellaneous topics involving partial differential equations (For equations on manifolds, see 58Gxx; for manifolds of solutions, see 58Bxx; for stochastic PDEs, see also 60H15)-Partial differential equations with

randomness (See also 60H15); 60H15 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Stochastic analysis (See also 58G32)-Stochastic partial differential equations (See also 35R60); 60H20 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Stochastic analysis (See also 58G32)-Stochastic integral equations

1/5/239 (Item 29 from file: 239)
DIALOG(R)File 239:Mathsci

02539187 CMP 1 345 575
Getting started in mathematical biology.
Hoppensteadt, Frank (Center for Systems Science and Engineering; Department of Electrical and Computer Engineering, Arizona State University, Tempe, Arizona, 85287
Corporate Source Codes: 1-AZS-SY
Notices Amer. Math. Soc.
Notices of the American Mathematical Society, 1995, 42, no. 9, 969--975. ISSN: 0002-9920 CODEN: AMNOAN
Language: English
Document Type: Journal
Journal Announcement: 9516
Subfile: CMP (Current Mathematical Publications) AMS
Review Type: No review planned
Descriptors: *92-01 -Biology and other natural sciences, behavioral sciences-Instructional exposition (textbooks, tutorial papers, etc.)

1/5/240 (Item 30 from file: 239)
DIALOG(R)File 239:Mathsci

02495669 MR 95d#35189
Asymptotic solutions of linear partial differential equations of first order having random coefficients.
Hoppensteadt, F. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Khasminskii, R. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Salehi, H. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824
(Salehi, Habib)
Corporate Source Codes: 1-MIS-S; 1-MIS-S; 1-MIS-S
Random Oper. Stochastic Equations
Random Operators and Stochastic Equations, 1994, 2, no. 1, 61--78. ISSN: 0926-6364
Language: English Summary Language: English
Document Type: Journal
Journal Announcement: 9412
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (36 lines)
The authors investigate initial value problems for equations of the form $(\partial/\partial t)u\sb \epsilon(x,t,\omega)+b\sb \epsilon(x,t,\omega)\cdot\nabla u\sb \epsilon(x,t,\omega)=F\sb \epsilon(x,t,\omega)$ $(t>0$, $x\in\bold R\sp k)$, $u\sb \epsilon(x,0,\omega)=\phi\sb \epsilon(x,\omega)$ $(x\in\bold R\sp k)$, where $\epsilon>0$ is a small parameter and ω denotes the randomness of the coefficients and consequently, of the solutions. Two cases are considered in detail: (1) If the randomness in the coefficients has order $O(\epsilon)$, then the perturbed problem is shown to have a unique solution $u\sb \epsilon$ for each small value of ϵ. Furthermore, if $$\bold E\vert b\sb \epsilon(x,t)-b\sb 0(x,t)\vert \sp p+\bold E\vert F\sb \epsilon(x,t)-F\sb 0(x,t)\vert \sp p\leq c\epsilon\sp p$$ holds for

some $p\geq 1$, then it follows that $\bold E\vert u\sb \epsilon(x,t)-u\sb 0(x,t)\vert \sp p\leq c\sb 1\epsilon\sp p$, where, specifically in the case $\epsilon=0$, all coefficients are nonrandom. (2) If the coefficients are highly oscillatory, in particular, if there exist mappings b and F being Lipschitz continuous with respect to x and such that $b\sb \epsilon(x,t,\omega)=b(x,t/\epsilon,\omega)$ and $F\sb \epsilon(x,t,\omega)=F(x,t/\epsilon,\omega)$, the authors show that $\lim\sb {\epsilon\to 0}\bold E\vert u\sb \epsilon(x,t)-u\sb 0(x,t)\vert =0$ uniformly on any finite time interval, providing the existence of a function $\overline b$ with $$\lim\sb {T\to\infty}\sup\sb {t\sb 0>0}\bold E\Big\vert T\sp {-1}\cdot\int\sp {t\sb 0+T}\sb {t\sb 0}b(x,s)\,ds-\overline b(x)\Big\vert =0,$$ and similarly for F. In addition, under a mixing condition on the coefficients the authors approximate the distribution of the normalized solution $\epsilon\sp {-1/2}(u\sb \epsilon(x,t,\omega)-u\sb 0(x,t))$ in terms of a Gaussian Markov process that is found as the solution of an associated linear stochastic differential equation. Finally, the results are applied to approximate the moments of the solution to the case where $b\sb 0\equiv 0$, and to the case where the coefficients b and F have a special form of almost periodic random processes.

Reviewer: Manthey, Ralf (D-FSU)
Review Type: Signed review
Descriptors: *35R60 -Partial differential equations-Miscellaneous topics involving partial differential equations (For equations on manifolds, see 58Gxx; for manifolds of solutions, see 58Bxx; for stochastic PDEs, see also 60H15)-Partial differential equations with randomness (See also 60H15) ; 35C20 -Partial differential equations-Representations of solutions-Asymptotic expansions; 60H25 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Stochastic analysis (See also 58G32)-Random operators and equations (See also 47B80)

1/5/241 (Item 31 from file: 239)
DIALOG(R)File 239:Mathsci

02483688 MR 95a#92013
A particle method for population waves.
Chiu, Chichia (Department of Mathematics, Michigan State University, East Lansing, Michigan, 48824)
Hoppensteadt, Frank C. (Department of Mathematics, Michigan State University, East Lansing, Michigan, 48824
Corporate Source Codes: 1-MIS; 1-MIS
SIAM J. Appl. Math.
SIAM Journal on Applied Mathematics, 1994, 54, no. 2, 466--477.
ISSN: 0036-1399 CODEN: SMJMAP
Language: English Summary Language: English
Document Type: Journal
Journal Announcement: 9409
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (17 lines)
Particle methods, sometimes referred to as vortex methods, are numerical methods that have been developed and used in computational physics, especially in computational fluid dynamics. The idea is to simulate a fluid flow by a finite number of fluid particles. The solution can be described mathematically by a sum of Dirac delta functions. In this way, the solution of equations governing the fluid flow can be obtained by tracking a finite number of fluid particles and evaluating velocities by discretizing certain singular integrals. Similar ideas can be applied to solving equations arising in cell biology.

Phase models are useful for studying synchronization of bacterial cell culture growth and other biological events associated with cell cycles. This paper considers a model that allows the growth rates of cells to change at different phases of the cell cycle. A particle method is derived for solving the weak formulation of this model, and convergence of this particle method is proved.

Reviewer: Kirlinger, Gabriela (A-TUWN-AM)
Review Type: Signed review
Descriptors: *92D25 -Biology and other natural sciences, behavioral sciences-Genetics and population dynamics-Population dynamics (general) ; 65C20 -Numerical analysis-Numerical simulation (For theoretical aspects, see 68U20)-Models, numerical methods; 92-08 -Biology and other natural sciences, behavioral sciences-Computational methods; 92B05 -Biology and other natural sciences, behavioral sciences-Mathematical biology in general -General biology and biomathematics

1/5/242 (Item 32 from file: 239)
DIALOG(R)File 239:Mathsci

02414276 MR 94a#34003
Analysis and simulation of chaotic systems.
Hoppensteadt, Frank C. (College of Natural Science, East Lansing, Michigan, 48824
Corporate Source Codes: 1-MISN
Publ: Springer-Verlag, New York,
1993, xviii+305 pp. ISBN: 0-387-97916-6
Series: Applied Mathematical Sciences, 94.
Price: $49.00.
Language: English Summary Language: English
Document Type: Book
Journal Announcement: 9308
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (46 lines)
This book is a somewhat disorganized introduction to dynamical systems and their perturbations and bifurcations. Although a great many theorems are stated (almost always with no proof or at best a very sketchy proof), these theorems are often hidden under obscure or misleading section titles. (This confusion of titles begins with the title of the book itself, the great majority of which deals with nonchaotic systems.) Under the section heading ``Stroboscopic methods'' in the chapter on ``Free oscillations'' one finds brief discussions of chaotic interval maps, entropy, Markov chains, circle maps, annulus maps, and homoclinic points, all of which are primarily of importance for forced rather than free oscillations. Under ``Implicit function theorems'' one finds the Fredholm alternative and the Lyapunov-Schmidt method. The preface claims that the book makes significant use of the concept of stability under persistent disturbances (SPD). In fact, this concept is defined on page 91 (it is a somewhat odd combination of certain aspects of orbital and structural stability), one theorem about it is stated without proof on page 104, and on page 191 it is claimed that the ideas of the method of averaging are related to those of SPD; these are the only references to SPD that the reviewer could find. Occasionally the statement of a theorem is misleading; the section on Floquet's theorem claims (as usual without proof) that the logarithm of a nonsingular matrix always exists, without pointing out that such a logarithm may be complex and that in these cases a real Floquet reduction can only be obtained by using double the least period of the system.

The chapters of this book cover the following topics. (The descriptions are the reviewer's own, not those of the chapter and section titles.) Chapter 1, linear systems. Chapter 2, introductory ideas about nonlinear systems and maps. Chapter 3, stability of various kinds. Chapter 4, bifurcation of rest points and periodic solutions. This much constitutes Part I of the book; the rest, Part II, is titled ``Perturbation methods''. Chapter 5, regular perturbation theory. Chapter 6, an introduction to forced oscillations and resonance, with the standard example of Duffing's equation, and a somewhat disconnected section about fractals, Newton's method, Julia sets, and fractal basin boundaries. (Recall that Part II of the book is supposed to be about perturbation methods; the text gives no clue that these fractal basin boundaries do not occur within the range of parameters for which perturbation methods are suitable.) Chapter 7, methods of averaging, including a brief reference to the KAM theorem but none to higher-order averaging or the Nekhoroshev theorem. Chapter 8,

initial layer and boundary layer problems and relaxation oscillations.
Reviewer: Murdock, James A. (1-IASU)
Review Type: Signed review
Descriptors: *34-01 -Ordinary differential equations-Instructional exposition (textbooks, tutorial papers, etc.) ; 00A69 -General-General and miscellaneous specific topics-General applied mathematics (For physics, see 00A79 and Sections 70 through 86); 34Cxx -Ordinary differential equations-Qualitative theory (See also 58Fxx); 58F13 -Global analysis, analysis on manifolds (See also 32Cxx, 32Fxx, 46-XX, 47Hxx, 53Cxx; for geometric integration theory, see 49Q15)-Ordinary differential equations on manifolds; dynamical systems (See also 28D10, 34Cxx, 54H20)-Strange attractors; chaos and other pathologies (See also 70K50); 65L99 -Numerical analysis-Ordinary differential equations-None of the above, but in this section

1/5/243 (Item 33 from file: 239)
DIALOG(R)File 239:Mathsci

02316869 CIS 7504565
Mathematical theories of populations: Demographics, genetics and epidemics
Hoppensteadt, Frank
Publ: SIAM, Society for Industrial and Applied Mathematics, Philadelphia, PA
1975, 72 pages
Language: English
Document Type: Book
Subfile: CIS (Current Index to Statistics) ASA/IMS

1/5/244 (Item 34 from file: 239)
DIALOG(R)File 239:Mathsci

02314421 CMP 180 071
Signal processing by model neural networks.
Hoppensteadt, F. C. (Department of Mathematics, Michigan State University, East Lansing, Michigan, 48824
Corporate Source Codes: 1-MIS
SIAM Rev.
SIAM Review. A Publication of the Society for Industrial and Applied Mathematics, 1992, 34, no. 3, 426--444. ISSN: 0036-1445 CODEN: SIREAD
Language: English Summary Language: English
Document Type: Journal
Journal Announcement: 9217
Subfile: CMP (Current Mathematical Publications) AMS
Review Type: No review planned
Descriptors: *68T05 -Computer science (For papers involving machine computations and programs in a specific mathematical area, see Section --04 in that area)-Artificial intelligence (See also 92J40)-Learning and adaptive systems ; 82C32 -Statistical mechanics, structure of matter-Time-dependent statistical mechanics (dynamic and nonequilibrium)-Neural nets (See also 68T05, 92B20, 92J40); 92B20 -Biology and other natural sciences, behavioral sciences-Mathematical biology in general-Neural networks (See also 68T05, 82C32, 94Cxx)

1/5/245 (Item 35 from file: 239)
DIALOG(R)File 239:Mathsci

02301166 MR 92k#92001
Mathematics in medicine and the life sciences.
Hoppensteadt, Frank C. (College of Natural Science, East Lansing,

Michigan, 48824)
Peskin, Charles S. (Courant Institute of Mathematical Sciences, New York University, New York, New York, 10003
Corporate Source Codes: 1-MISN; 1-NY-X
Publ: Springer-Verlag, New York,
1992, xii+252 pp. ISBN: 0-387-97639-6
Series: Texts in Applied Mathematics, 10.
Price: $39.95.
Language: English
Document Type: Book
Journal Announcement: 9205
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (33 lines)

From the preface: ``The techniques presented here range in mathematical difficulty up to calculus and matrix theory. The material is presented in general order of increasing mathematical difficulty. Some exercises deal with material in preceding sections, others are projects that extend preceding material.

``Our purpose in this book is not the systematic presentation of mathematical material, although there are important threads that run through several chapters. Instead, we hope to illustrate how mathematics can be used. In particular, our goal is to make available to students, having at least one term of calculus, topics in the life sciences and medicine that have benefited from mathematical modeling and analysis. In addition to exposing students to current ideas, the material is intended to reinforce their mathematics education by presenting familiar mathematical topics from novel points of view. Finally, enabling students to think in terms of models early in their academic experience should motivate them to develop and apply modeling skills further.

``The mix of topics, taken largely from population biology and from physiology, includes important phenomena that are within reach of the students described above. The population part of the book draws its material from the areas of demographics, genetics, epidemics, and biogeography, while the physiological part surveys cardiovascular, pulmonary, renal, and muscle physiology. The final chapter is intended to introduce students to models of nerve cells and some neural circuits as a basis for studying how the brain works.''

The chapter headings are: Introduction; 1. The mathematics of populations: demographics; 2. Inheritance; 3. A theory of epidemics; 4. Biogeography; 5. The heart and circulation; 6. Gas exchange in the lungs; 7. Control of cell volume and the electrical properties of cell membranes; 8. The renal countercurrent mechanism; 9. Muscle mechanics; 10. Biological clocks and mechanisms of neural control.

Reviewer: From the preface
Review Type: Abstract
Descriptors: *92-01 -Biology and other natural sciences, behavioral sciences-Instructional exposition (textbooks, tutorial papers, etc.)

1/5/246 (Item 36 from file: 239)
DIALOG(R)File 239:Mathsci

02169579 MR 90m#92021

Intermittent chaos, self-organization, and learning from synchronous synaptic activity in model neuron networks.

Hoppensteadt, F. C. (Department of Mathematics, Michigan State University, East Lansing, Michigan, 48824
Corporate Source Codes: 1-MIS
Proc. Nat. Acad. Sci. U.S.A.
Proceedings of the National Academy of Sciences of the United States of America, 1989, 86, no. 9, 2991--2995. ISSN: 0027-8424 CODEN: PNASA6
Language: English
Document Type: Journal
Journal Announcement: 2112
Subfile: MR (Mathematical Reviews) AMS

Abstract Length: MEDIUM (21 lines)

A voltage-controlled oscillator neuron model (VCON) of a single neuron with cell body potential $\cos x(t)$, stimulated through a synapse having presynaptic potential $\cos y(t)$, is modeled by the equation $dx/dt=\omega+ C\cos_+x(t)\cos_+y(t)$; where $\cos_+(u)$ denotes $\cos(u)$ if $\cos(u)\geq 0$ and 0 otherwise, and C denotes connection strength. It is shown numerically that phase locking to input frequencies occurs in this model. A plot is made of the output/input frequency ratio $R=\lim_{t\rightarrow\infty} x(t)/y(t)$, in the case $y(t)=\mu t$. A graph of R, as a function of ω/μ, is shown to have visible plateaus at 1, $\tfrac 12$, etc. Learning is demonstrated by a second model $dx/dt=\omega+u$, $\tau\,du/dt+u=C\cos_+x\cos_+y$, with time constant τ. For this model, the plateau at $R=1$ becomes noticeably wider. In a third example, a network of VCONs is modeled by the system $dx/dt=w+f(x)$. It is shown that if w is nearly proportional to a vector of integers n, then x_i/x_k can tend to n_i/n_k as $t\rightarrow\infty$, and again phase locking can occur. A circular array of VCONs, connected in rotationally symmetric fashion, is used to demonstrate self-organization in both the space and time domains. For this model the connection strengths are also modified.

Reviewer: Noonburg, Virginia W. (1-HRTF)
Review Type: Signed review
Descriptors: *92A09 -Biology and behavioral sciences-Physiology, biochemistry (See also 76-XX, in particular 76Zxx, and 78A70, 80A30, 80A32, 92A27, 92A40) ; 58F40 -Global analysis, analysis on manifolds (See also 32Cxx, 32Fxx, 46-XX, 47Hxx, 53Cxx; for geometric integration theory, see 49F20, 49F22)-Ordinary differential equations on manifolds; dynamical systems (For abstract and topological dynamics, see also 28D10, 34C35, 34C40, 54H20)-Applications; 68T05 -Computer science (For papers involving machine computations and programs in a specific mathematical area, see section --04 in that area)-Artificial intelligence-Learning and adaptive systems

1/5/247 (Item 37 from file: 239)
DIALOG(R)File 239:Mathsci

02165136 MR 90k#92042
Synchronization of bacterial culture growth.
Mathematical approaches to problems in resource management and epidemiology (Ithaca, NY, 1987)
Hoppensteadt, F. C. (Department of Statistics and Probability, Michigan State University, East Lansing, Michigan, 48824)
Corporate Source Codes: 1-MIS-S
1989,
Springer, Berlin-New York,; 16--22,,
Series: Lecture Notes in Biomath., 81,
Language: English
Document Type: Proceedings Paper
Journal Announcement: 9008
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: SHORT (5 lines)
Summary: ``Synchronization of cell doubling times due to alternating starvation-nutrition cycles is studied here using a method based on nonlinear Lexis diagrams and the assumption that the cell cycle has three phases---pre-replication, replication and post-replication---the middle of which is always of fixed length once started.''
{For the entire collection see MR 90j:92032}.
Reviewer: Summary
Review Type: Abstract
Proceedings Reference: 90j#92032; 041 316
Descriptors: *92A15 -Biology and behavioral sciences-Population dynamics, epidemiology

1/5/248 (Item 38 from file: 239)

DIALOG(R)File 239:Mathsci

02036331 MR 88h#92040

A mathematical analysis of small mammal populations.

Hoppensteadt, F. C. (Department of Mathematics, Michigan State University, East Lansing, 48824, Michigan)
Murphy, L. (Department of Mathematics, Oregon State University, Corvallis, 97331, Oregon
Corporate Source Codes: 1-MIS; 1-ORS
J. Math. Biol.
Journal of Mathematical Biology, 1987, 25, no. 3, 263--274. ISSN: 0303-6812 CODEN: JMBLAJ
Language: English
Document Type: Journal
Journal Announcement: 1916
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (12 lines)
Summary: ``Populations of Microtus montanus, the montane vole, have been extensively studied. It is known that their reproductive activity is closely linked to the availability of the chemicals in growing plants. We use a mathematical model here to study how the length of the vegetative season and the natural reproduction rhythm of voles are involved in the long term dynamics of the population numbers. In particular, we use data obtained from Timpie Springs, Utah, and from Jackson Hole, Wyoming, to formulate a model. The novelty of this model is its use of littering curves that highlight the temporally discrete nature of vole reproduction. The model shows how the timing of the vegetative season can influence vole population sizes.''
Reviewer: Summary
Review Type: Abstract
Descriptors: *92A15 -Biology and behavioral sciences-Population dynamics, epidemiology

1/5/249 (Item 39 from file: 239)
DIALOG(R)File 239:Mathsci

02032530 MR 88g#92016

An introduction to the mathematics of neurons.

Hoppensteadt, F. C. (Department of Mathematics, University of Utah, Salt Lake City, 84112, Utah
Corporate Source Codes: 1-UT
Publ: Cambridge University Press, Cambridge-New York,
1986, xvi+175 pp. ISBN: 0-521-30566-7; 0-521-31574-3
Series: Cambridge Studies in Mathematical Biology, 6.
Price: $49.50; \$17.95 paperbound.
Language: English
Document Type: Book
Journal Announcement: 1913
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (28 lines)
The book aims to be a textbook on neuronal modeling for an undergraduate course in mathematical biology. In fact it outlines mainly the studies of the author concerning the oscillatory aspects of the neuronal activity, by using his own model of the neuron and methods of electronic circuits. In the first part, the model of axonic propagation of Hodgkin and Huxley and its simplified form by FitzHugh and Nagumo are reviewed briefly. Later, a neuromime model is introduced and its characteristics of phase-resetting are analyzed. The neuromime is based on an integrated circuit which is able to simulate the activity of a neuron only for a variable related to the phase of firing. The properties of phase-blocking in coupled neuromimes are studied by using the rotation vector method. A section is devoted to the simulation of the control system of the respiratory activity in humans and to the reproduction of the activity-splitting patterns in rodents. The study of neural networks is undertaken in the

last two sections, in which the model of Hopfield is briefly described and a continuous network, composed of neuromimes of the type considered by the author, is introduced. Here, the properties of phase-blocking in a discrete network, with eight elements, are also studied by means of a numerical simulation. A short appendix on the mathematical background, with a model of the harmonic oscillator, and the Fourier and Laplace transforms, ends the book. The bibliography does not give complete information about the modeling of (rhythmic) activity either of single neurons or of neural networks. All the sections are supplied with exercises, the solutions for which are given.

Reviewer: Ventriglia, F. (Naples)
Review Type: Signed review
Descriptors: *92A09 -Biology and behavioral sciences-Physiology, biochemistry (See also 76-XX, in particular 76Zxx, and 78A70, 80A30, 80A32, 92A27, 92A40)

1/5/250 (Item 40 from file: 239)
DIALOG(R)File 239:Mathsci

02000309 CIS 8801217
A mathematical analysis of small mammal populations
Hoppensteadt, F. C.
Murphy, L.
J. Math. Biol. JMathBio (CIS abbrev)
Journal of Mathematical Biology, 1987, 25, 263-274 ISSN: 0303-6812 CODEN: jmblaj
Language: English
Document Type: Journal
Subfile: CIS (Current Index to Statistics) ASA/IMS
Identifiers: Renewal theory

1/5/251 (Item 41 from file: 239)
DIALOG(R)File 239:Mathsci

01978068 MR 87h#92024
Synchronized oscillations in networks of neuron analogue circuits.
Hoppensteadt, F. C. (Department of Mathematics, University of Utah, Salt Lake City, 84112, Utah
Corporate Source Codes: 1-UT
IMA J. Math. Appl. Med. Biol.
IMA Journal of Mathematics Applied in Medicine and Biology, 1984, 1, no. 2, 135--148. ISSN: 0265-0746
Language: English
Document Type: Journal
Journal Announcement: 1816
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: SHORT (6 lines)
Summary: ``We introduce a simplified circuit analogue of a nerve cell. This circuit is based on modulation of a voltage-controlled oscillator by signals entering through a circuit analogue of a chemical synapse. We describe phase locking of frequency-encoded information, and we show that large networks can sustain stable spatial patterns of phase-locked behaviour.''
Reviewer: Summary
Review Type: Abstract
Descriptors: *92A09 -Biology and behavioral sciences-Physiology, biochemistry (See also 76-XX, in particular 76Zxx, and 78A70, 80A30, 80A32, 92A27, 92A40)

1/5/252 (Item 42 from file: 239)
DIALOG(R)File 239:Mathsci

01905404 MR 86d#45015

Stable oscillations of weakly nonlinear Volterra integro-differential equations.

Hoppensteadt, F. C. (Department of Mathematics, University of Utah, Salt Lake City, 84112, Utah)
Schiaffino, A
Corporate Source Codes: 1-UT

J. Reine Angew. Math.
Journal fur die Reine und Angewandte Mathematik , 1984, 353, 1--13.
ISSN: 0075-4102 CODEN: JRMAA8
Language: English
Document Type: Journal
Journal Announcement: 1704
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: SHORT (10 lines)

For a class of Volterra integro-differential equations results about the existence and stability of periodic solutions are derived which are analogous to known results for ordinary differential equations. The equations are small (as measured by a parameter ε) nonlinear perturbations of linear ones. There are two cases. In the first the perturbation is periodic and the result is about forced oscillations. In the second the unperturbed linear problem describes uncoupled harmonic oscillators and the result is about phase-locked self-sustained oscillations. An equation describing an electronic circuit is discussed as an example.

Reviewer: Diekmann, O. (Amsterdam)
Review Type: Signed review
Descriptors: *45J05 -Integral equations-Integro-ordinary differential equations ; 70K20 -Mechanics of particles and systems (For relativistic mechanics, see 83A05 and 83C10; for statistical mechanics, see 82-XX)-Nonlinear motions (See also 34Cxx, 58Fxx)-Stability; 92A15 -Biology and behavioral sciences-Population dynamics, epidemiology

1/5/253 (Item 43 from file: 239)
DIALOG(R)File 239:Mathsci

01862134 MR 85f#45003

An algorithm for approximate solutions to weakly filtered synchronous control systems and nonlinear renewal processes.

Hoppensteadt, F. C. (Department of Mathematics, University of Utah, Salt Lake City, 84112, Utah
Corporate Source Codes: 1-UT

SIAM J. Appl. Math.
SIAM Journal on Applied Mathematics, 1983, 43, no. 4, 834--843.
ISSN: 0036-1399 CODEN: SMJMAP
Language: English
Document Type: Journal
Journal Announcement: 1524
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (18 lines)

The author considers singular perturbation problems for nonlinear Volterra integro-differential equations whose kernels have components near the Dirac delta functional. Although in general the equations do not reduce to equivalent systems of differential equations, the author finds a way to attack the problem by natural generalizations of methods used to study singularly perturbed initial and initial-boundary problems for ordinary and partial differential equations. Using earlier results concerning differential equations [Comm. Pure Appl. Math. 24 (1971), 807--840; MR 44#5576; Arch. Rational Mech. Anal. 35 (1969), 284--298; MR 40#1694] the author applies the method of matched asymptotic expansions to the Volterra equations directly. In a separate section the case of linear convolution equations is studied in great detail. The problems considered are well motivated by two instructive examples, one from the study of weakly filtered phase-locked loop electrical circuits, the other from

nonlinear renewal equations describing the population dynamics of a demographic process.
Reviewer: Groh, Jurgen (Jena)
Review Type: Signed review
Descriptors: *45D05 -Integral equations-Volterra integral equations (See also 34A10) ; 92A15 -Biology and behavioral sciences-Population dynamics, epidemiology

1/5/254 (Item 44 from file: 239)
DIALOG(R)File 239:Mathsci

01855583 MR 85d#45011
An averaging method for Volterra integral equations with applications to phase-locked feedback systems.
Equadiff 82 (Wurzburg, 1982)
Hoppensteadt, F. C. (Department of Mathematics, University of Utah, Salt Lake City, 84112, Utah
Corporate Source Codes: 1-UT
1983,
Springer, Berlin-New York,; 256--265,,
Series: Lecture Notes in Math., 1017,
Language: English
Document Type: Proceedings Paper
Journal Announcement: 1605
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: SHORT (5 lines)
An averaging scheme is justified for the Volterra integro-differential equation $\dot x(t)=f(t, \varepsilon)+\varepsilon\int\sb 0\sp tk(t-s)F(x(s), \varepsilon)\,ds$, where $x(t)\in{\bf R}\sp N$ and $\varepsilon>0$ is a small parameter. A number of practical examples containing phase-locked loops are considered.
{For the entire collection see MR 84j:00010}.
Reviewer: Bainov, D. (Sofia)
Review Type: Signed review
Proceedings Reference: 84j#00010; 726 563
Descriptors: *45E10 -Integral equations-Singular integral equations (See also 30E20, 30E25, 44A15, 44A35)-Integral equations of the convolution type (Abel, Picard, Toeplitz and Wiener-Hopf type) (See also 47B35) ; 34C29 -Ordinary differential equations-Qualitative theory-Averaging method (See also 47H10)

1/5/255 (Item 45 from file: 239)
DIALOG(R)File 239:Mathsci

01846290 MR 85a#65131
An extrapolation method for the numerical solution of singular perturbation problems.
Hoppensteadt, F. C. (Department of Mathematics, University of Utah, Salt Lake City, 84112, Utah)
Miranker, W. L. (IBM Thomas J. Watson Research Center, Yorktown Heights, 10598, New York
Corporate Source Codes: 1-UT; 1-IBM
SIAM J. Sci. Statist. Comput.
Society for Industrial and Applied Mathematics. Journal on Scientific and Statistical Computing, 1983, 4, no. 4, 612--625. ISSN: 0196-5204
CODEN: SIJCD4
Language: English
Document Type: Journal
Journal Announcement: 1605
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: SHORT, 9 lines
Authors' summary: ``We show how the form of the perturbation approximation for the solution of stiff systems of ordinary differential

equations with an identifiable small parameter can be used to generate associated nonstiff or relaxed equations. Solutions of these relaxed equations are easily calculated, and appropriate combinations of these solutions furnish numerical approximations to the original stiff problem. Variations of this method are applied to two classes of initial value problems: those with highly oscillatory solutions and those with rapidly equilibrating solutions.''

Reviewer: Summary

Review Type: Abstract

Descriptors: *65L99 -Numerical analysis-Ordinary differential equations-Topics not covered by other classifications in this subsection ; 34E15 -Ordinary differential equations-Asymptotic theory-Singular perturbations, general theory

1/5/256 (Item 46 from file: 239)

DIALOG(R)File 239:Mathsci

01801020 STR 012831

AN EXTRAPOLATION METHOD FOR THE NUMERICAL SOLUTION OF STIFF DIFFERENTIAL EQUATIONS.

Hoppensteadt, F. C. (International Business Machines Corporation (IBM), Research Division

1979,

Language: English

Document Type: Technical Report

RC 7697.

Subfile: STR (Stanford Technical Reports)

Identifiers: ORDINARY DIFFERENTIAL EQUATIONS STIFF PERTURBATION METHOD

1/5/257 (Item 47 from file: 239)

DIALOG(R)File 239:Mathsci

01800355 STR 006840

DIFFERENTIAL EQUATIONS HAVING RAPIDLY CHANGING SOLUTIONS: ANALYTIC METHODS FOR WEAKLY NONLINEAR SYSTEMS.

Hoppensteadt, F.

Miranker, W. L. (International Business Machines Corporation (IBM), Research Division

1975,

Language: English

Document Type: Technical Report

RC 5429.

Subfile: STR (Stanford Technical Reports)

Identifiers: INITIAL VALUE PROBLEMS

1/5/258 (Item 48 from file: 239)

DIALOG(R)File 239:Mathsci

01800152 STR 005824

NUMERICAL SOLUTION OF DIFFERENTIAL EQUATIONS WITH RAPIDLY CHANGING SOLUTIONS.

Hoppensteadt, F.

Miranker, W. L. (International Business Machines Corporation (IBM), Research Division

1974,

Language: English

Document Type: Technical Report

RC 4792.

Subfile: STR (Stanford Technical Reports)

1/5/259 (Item 49 from file: 239)
DIALOG(R)File 239:Mathsci

01766947 MR 84m#92012
Phase locking of biological clocks.
Hoppensteadt, F. C.
Keener, J. P.
J. Math. Biol.
Journal of Mathematical Biology, 1982, 15, no. 3, 339--349. ISSN: 0303-6812 CODEN: JMBLAJ
Language: English
Document Type: Journal
Journal Announcement: 1509
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (17 lines)
Under certain conditions, the FitzHugh - Nagumo model of nerve membranes can be averaged and rewritten as r= mu r(1 - r), theta =1, from which one sees that all solutions starting with r > 0, theta = theta {sub}0, have the same phase for all time. This is the content of the notion of radial isochron clock (RIC). The authors study the application of a stimulus A at regular time intervals when the phase is determined by theta =1+ delta (t/T - 1/T)f(A, theta), where f is the strength of a phase resetting change, which occurs when t is an integer multiple of T, and delta is the Dirac measure. The coupling between an external clock (phase theta) and an endogenous clock (phase psi) is described by theta = mu, psi = omega +F(psi - theta), where F is the coupling, mu is the external clock's free frequency and finally F(phi +2 pi)=F(phi). RIC systems can be shown to exhibit phase locking; this phenomenon is described by a system theta = omega + epsilon F(theta, epsilon), theta and F being n-vectors.
Reviewer: Haimovici, A. (Iasi)
Review Type: Signed review
Descriptors: *92A09 -Biology and other natural sciences, behavioral sciences-Physiology, biochemistry (See also 76-XX, in particular 76Zxx, and 78A70, 80A30, 80A32, 92A27, 92A40) ; 34C15 -Ordinary differential equations -Qualitative theory (See also 58Fxx)-Nonlinear oscillations

1/5/260 (Item 50 from file: 239)
DIALOG(R)File 239:Mathsci

01759839 MR 84j#92023
Integrate-and-fire models of nerve membrane response to oscillatory input.
Keener, J. P.
Hoppensteadt, F. C.
Rinzel, J.
SIAM J. Appl. Math.
SIAM Journal on Applied Mathematics, 1981, 41, no. 3, 503--517. ISSN: 0036-1399 CODEN: SMJMAP
Language: English
Document Type: Journal
Journal Announcement: 1408
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (30 lines)
In the integrate-and-fire model for the activity of nerve cells it is assumed that the nerve membrane potential at the locus where nerve impulses are generated summarizes or integrates the inputs (applied currents or post-synaptic potentials). At each time when the integral reaches a threshold value, an impulse is produced and the potential reset to its resting value. The integration is not perfect in time: the membrane potential steadily undergoes a linear decay process with a constant rate. Mathematically the model is described by the differential equation dv/dt= - av+f(t) in connection with the threshold condition v(t{sup}+)=0 if v(t)=v {sub}T, where v is the membrane potential, f the

input function, a the decay rate, and v{sub}T the threshold. The authors give a complete typology of what happens if the input is sinusoidal: f(t)=S{sub}0+S{sub}m cos(omega t+ phi). Namely, the behavior of the model is characterized in terms of a unique, parameter-dependent rotation number, describing the asymptotic relationship between impulse times and phases of forcing. Three types of behavior are associated with regions in parameter space having positive Lebesgue measure: either the sequence of impulses is periodic and phase locked to the input (rational rotation number), or the impulse times are ergodically distributed across the input phases (irrational rotation number), or the impulse sequence is finite. Other types of behavior for parameter sets of measure zero are discussed as well. Besides these analytical results, some numerical examples of typical cases are presented (phase densities and interspike time histograms). Finally, a close relationship is revealed to another biological oscillator model studied by L. Glass and M. C. Mackey [J. Math. Biol. 7 (1979), 339 - 352; MR 83b:92014].

Reviewer: an der Heiden, Uwe (Bremen)
Review Type: Signed review
Descriptors: *92A09 -Biology and other natural sciences, behavioral sciences-Physiology, biochemistry (See also 76-XX, in particular

1/5/261 (Item 51 from file: 239)
DIALOG(R)File 239:Mathsci

01724549 MR 83h#92020
Electrical models of neurons.
Mathematical aspects of physiology (Proc. Summer Sem., Univ. Utah, Salt Lake City, Utah, 1980)
Hoppensteadt, F. C.
1981,
Amer. Math. Soc., Providence, R.I.,; pp. 327--344,,
Series: Lectures in Appl. Math., 19,
Language: English
Document Type: Proceedings Paper
Journal Announcement: 1323
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: SHORT (5 lines)
Several tunnel diode oscillator circuits are described which model FitzHugh - Nagumo type neurons. The phase-locking behavior of these neural models is described in detail using Fourier methods, stroboscopic methods and rotation numbers. (For the entire collection see MR 82f:92003.)
Reviewer: Scott, Alwyn C. (Los Alamos, N.M.)
Review Type: Signed review
Proceedings Reference: 82f#92003; 623 286
Descriptors: *92A09 -Biology and other natural sciences, behavioral sciences-Physiology, biochemistry (See also 76-XX, in particular ; 34C05 -Ordinary differential equations-Qualitative theory (See also 58Fxx)-Location of integral curves, singular points, limit cycles; 58F14 -Global analysis, analysis on manifolds (See also 32Cxx, 32Fxx, 46-XX, 47Hxx, 53Cxx; for geometric integration theory, see 49Q15)-Ordinary differential equations on manifolds; dynamical systems (See also 28D10, 34Cxx, 54H20)-Bifurcation theory and singularities

1/5/262 (Item 52 from file: 239)
DIALOG(R)File 239:Mathsci

01721225 MR 83g#92047
Threshold analysis of a drug use epidemic model.
Hoppensteadt, F. C.
Murray, J. D.
Math. Biosci.
Mathematical Biosciences. An International Journal, 1981, 53, no.

1-2, 79--87. ISSN: 0025-5564 CODEN: MABIAR
Language: English
Document Type: Journal
Journal Announcement: 1317
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (11 lines)
The response of an individual to a drug is modeled in the case when free and bound sites equilibrate rapidly and also in the case when the drug binds permanently to the receptor sites. Then the population dynamics of drug use is modeled by using an infectious disease model where nonusers are susceptibles and active drug users are infectives. Nonusers are assumed to become users through contact with active users. A threshold parameter is identified so that below the critical threshold value, drug use dies out. Above the threshold value, there is an epidemic of drug use. No drugs or populations to which the model could be applied are mentioned.
Reviewer: Hethcote, H. W. (Iowa City, Iowa)
Review Type: Signed review
Descriptors: *92A15 -Biology and other natural sciences, behavioral sciences-Population dynamics, epidemiology

1/5/263 (Item 53 from file: 239)
DIALOG(R)File 239:Mathsci

01720250 MR 83g#65075
Computation by extrapolation of solutions of singular perturbation problems.
Analytical and numerical approaches to asymptotic problems in analysis (Proc. Conf., Univ. Nijmegen, Nijmegen, 1980)
Hoppensteadt, F. C.
Miranker, W. L.
1981,
North-Holland, Amsterdam-New York,; pp. 73--85,,
Series: North-Holland Math. Stud., 47,
Language: English
Document Type: Proceedings Paper
Journal Announcement: 1312
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: SHORT (9 lines)
Authors' summary: ``We show how the asymptotic form of the solution of singular perturbation problems can be used to generate associated unperturbed or relaxed equations. Solutions of these relaxed equations are easily calculated, and appropriate combinations of them furnish numerical approximations to the original problem. Variations of this method are applied to two classes of initial problems: those with rapidly equilibrating solutions and those with highly oscillatory solutions.'' (For the entire collection see MR 81m:65005.)
Reviewer: Authors' summary
Review Type: Abstract
Proceedings Reference: 81m#65005; 605 494
Descriptors: *65L05 -Numerical analysis-Ordinary differential equations-Initial value problems ; 34E05 -Ordinary differential equations-Asymptotic theory-Asymptotic expansions; 41A60 -Approximations and expansions (For all approximation theory in the complex domain, see 30E05 and-Asymptotic approximations, asymptotic expansions (steepest descent, etc.) (See also 30E15)

1/5/264 (Item 54 from file: 239)
DIALOG(R)File 239:Mathsci

01704654 MR 83b#92064
Mathematical methods of population biology.
Hoppensteadt, Frank C.

Publ: Cambridge University Press, Cambridge-New York,
1982, viii+149 pp. ISBN: 0-521-23846-3; 0-521-28256-X
Series: Cambridge Studies in Mathematical Biology, 4.
Price: $29.95;\ \$12.95 paperbound.
Language: English
Document Type: Book
Journal Announcement: 1411
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (15 lines)

This book gives a survey at an advanced undergraduate or graduate level of some of the more prominent mathematical methods which have proved useful for studying biological systems (i.e., population and genetic phenomena). The first two chapters deal with population dynamics (i.e., maximal sustained yield, maximal current revenue, optimal discounted future revenue), renewal theory, and reproduction matrices (i.e., honest and dishonest matrices), using difference equations in models of total population and population age structure. The third chapter surveys models of random population events using Markov chains (i.e., the two-state, hypergeometric, Polya, Fisher-Wright, and Reed - Frost chains). The last two chapters look at some of the mathematical methods used to examine the qualitative behavior of more complicated difference equations covering perturbation methods and dispersal processes.

Reviewer: Stauffer, Howard B. (Arcata, Calif.)
Review Type: Signed review
Descriptors: *92A15 -Biology and other natural sciences, behavioral sciences-Population dynamics, epidemiology ; 35K99 -Partial differential equations-Parabolic equations and systems (See also 35Bxx, 35Dxx, 35R30, 35R35, 58G11)-None of the above, but in this section; 60J70 -Probability theory and stochastic processes (For additional applications, see 11Kxx, 62-XX, 90-XX, 92-XX, 93-XX, 94-XX. For numerical results, see 65U05)-Markov processes-Applications of diffusion theory (population genetics, absorption problems, etc.) (See also 92Dxx); 92A10 -Biology and other natural sciences, behavioral sciences-Genetics

1/5/265 (Item 55 from file: 239)
DIALOG(R)File 239:Mathsci

01687450 MR 82k#92026
A flow mediated control model of respiration.
Some Mathematical Questions in Biology (Proc. 13th Sympos. Math. Biol., Houston, Tex., 1979)
Hoppensteadt, F. C.
Waltman, P.
1979,
Amer. Math. Soc., Providence, R.I.,; pp. 211--218,,
Series: Lectures Math. Life Sci., 12,
Language: English
Document Type: Proceedings Paper
Journal Announcement: 1408
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: SHORT (9 lines)

Authors' summary: ``A model of respiration control is formulated and analyzed. The model describes the blood concentration of a single solute (CO{sub}2) and the velocity of blood in brainstem circulation. The systemic and pulmonary circulations, the heart and the lung are lumped into one device (called the pump-filter) and the brainstem is represented by a single device (called the sensor-controller). The model exhibits a range of behavior from regular to chaotic breathing patterns, reminiscent of Cheyne-Stokes breathing, as parameters are changed.''

Reviewer: Authors' summary
Review Type: Abstract
Proceedings Reference: 82i#92001; 569 199
Descriptors: *92A09 -Biology and other natural sciences, behavioral sciences-Physiology, biochemistry (See also 76-XX, in particular 76Zxx, and 78A70, 80A30, 80A32, 92A27, 92A40) ; 58F13 -Global analysis, analysis on

manifolds (See also 32Cxx, 32Fxx, 46-XX, 47Hxx, 53Cxx; for geometric integration theory, see 49Q15)-Ordinary differential equations on manifolds; dynamical systems (See also 28D10, 34Cxx, 54H20)-Strange attractors; chaos and other pathologies (See also 70K50)

1/5/266 (Item 56 from file: 239)
DIALOG(R)File 239:Mathsci

01684236 MR 82j#92054
Pattern formation by bacteria.
Biological growth and spread (Proc. Conf., Heidelberg, 1979)
Hoppensteadt, F. C.
Jager, W.
1980,
Springer, Berlin-New York,; pp. 68--81,,
Series: Lecture Notes in Biomath., 38,
Language: English
Document Type: Proceedings Paper
Journal Announcement: 1314
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: SHORT (10 lines)
Bacteria can grow in spatial patterns in response to diffusion of a needed nutrient. In this paper the authors present a model which describes the histidine concentration, the concentration of the growth medium's buffer and the size of the bacterial population. The mathematical problem involves a coupled system of three reaction-diffusion equations in a one-dimensional cylindrical domain. The reaction functions in these equations are based on Michaelis - Menten kinetics. A heuristic argument and a numerical example are given. (For the entire collection see MR 82c:92004.)
Reviewer: Pao, C. V. (Raleigh, N.C.)
Review Type: Signed review
Proceedings Reference: 82c#92004; 609 340
Descriptors: *92A15 -Biology and other natural sciences, behavioral sciences-Population dynamics, epidemiology ; 35K55 -Partial differential equations-Parabolic equations and systems (See also 35Bxx, 35Dxx, 35R30, 35R35, 58G11)-Nonlinear PDE of parabolic type; 73P05 -Mechanics of solids-Biomechanics of solids-Biomechanics of solids (See also 92C10)

1/5/267 (Item 57 from file: 239)
DIALOG(R)File 239:Mathsci

01671400 MR 82f#92003
Mathematical aspects of physiology.
Proceedings of the Twelfth Summer Seminar on Applied Mathematics held at the University of Utah, Salt Lake City, Utah, June 15--27, 1980. Edited by Frank C. Hoppensteadt.
Contributors: **Hoppensteadt, Frank C.**
Publ: American Mathematical Society, Providence, R.I.,
1981, vi+394 pp. ISBN: 0-8218-1119-3
Series: Lectures in Applied Mathematics, 19.
Price: $38.00.
Language: English
Document Type: Book; Proceedings
Journal Announcement: 1323
Mathematical aspects of physiology; Summer Seminar: Applied Mathematics,; Physiology; Salt Lake City, Utah, 12th 1980
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (32 lines)
Contents: Frank C. Hoppensteadt, Foreword (pp. v - vi); Charles S. Peskin, Lectures on mathematical aspects of physiology (pp. 1 - 107); Richard Skalak, Blood rheology (pp. 109 - 139); Stephen Childress, Aspects of physiological fluid mechanics (pp. 141 - 163); Raul Mendez, Numerical

study of incompressible flow in a region bounded by elastic walls (p. 165); T. W. Secomb, Kinematics of close-packed red blood cells in shear flow (pp. 167 - 170); John L. Stephenson, Case studies in renal and epithelial physiology (pp. 171 - 212); J. E. Wood, A statistical-mechanical model of the molecular dynamics of striated muscle during mechanical transients (pp. 213 - 259); Dieter Schenzle, On neuroendocrine control of ovarian function (pp. 261 - 264); A. T. Winfree, Peculiarities in the impulse response of pacemaker neurons (pp. 265 - 279); John Rinzel, Models in neurobiology (pp. 281 - 297); James P. Keener, Chaotic cardiac dynamics (pp. 299 - 325); F. C. Hoppensteadt, Electrical models of neurons (pp. 327 - 344); Jonathan Bell, Threshold and conduction in prototype models of myelinated nerve axons: a preliminary report (pp. 345 - 347); David L. Barrow, Threshold for a reaction-diffusion equation related to nerve conduction (pp. 349 - 353); U. an der Heiden, M. C. Mackey and H. O. Walther, Complex oscillations in a simple deterministic neuronal network (pp. 355 - 360); H. T. Banks, Parameter identification techniques for physiological control systems (pp. 361 - 383); Walter T. Kyner and Gary A. Rosenberg, Parameter estimation techniques used in the determination of the bulk flow of brain interstitial fluid (pp. 385 - 388); James Wiskin, Modelling of stimulation evoked acetylcholine release from myenteric neurons and estimation of the parameters (pp. 389 - 394). (The papers of mathematical interest that appear to be in final form are being reviewed individually.)

Reviewer: Editors

Review Type: Table of contents

Descriptors: *92-06 -Biology and other natural sciences, behavioral sciences-Proceedings, conferences, collections, etc.; 34-06 -Ordinary differential equations-Proceedings, conferences, collections, etc.; 35-06 -Partial differential equations-Proceedings, conferences, collections, etc. ; 76-06 -Fluid mechanics (For general continuum mechanics, see 73Bxx, or other parts of 73-XX)-Proceedings, conferences, collections, etc.

1/5/268 (Item 58 from file: 239)

DIALOG(R)File 239:Mathsci

01612904 MR 81b#34028

Computer studies of nonlinear oscillators.

Nonlinear oscillations in biology (Proc. Tenth Summer Sem. Appl. Math., Univ. Utah, Salt Lake City, Utah, 1978)

Hoppensteadt, Frank C.

1979,

Amer. Math. Soc., Providence, R.I.,; pp. 131--139,,

Series: Lectures in Appl. Math., 17,

Language: English

Document Type; Proceedings Paper

Journal Announcement: 1215

Subfile: MR (Mathematical Reviews) AMS

Abstract Length: MEDIUM (25 lines)

A sample of nonlinear oscillation problems is presented to illustrate several numerical methods which have been successfully applied to the study of oscillatory phenomena. Results are summarized in this survey article. First, studies of Mathieu's equation suggest computer experiments which can be performed to study the response of a pendulum to oscillation of its support point. A pendulum having a vertically oscillating support point can have three (at least) stable responses coexisting for the same parameter values of forcing and tuning; the straight up and straight down positions as well as a continual rotation are all stable solutions of this problem. Computer experiments can be used in these cases to determine the domains of attraction of the various modes of response. This example also demonstrates the interesting fact that otherwise unstable static states can be stabilized by external oscillatory forcing. Next, stable oscillatory responses of the van der Pol equation to periodic forcing are described. The concept of rotation number can be used to summarize numerical experiments on subharmonic

solutions. Then it is described how computation of the power spectrum can be used to study the presence of higher harmonics. Finally, computer studies of certain chaotic dynamical systems are discussed. Numerical simulations are used to describe density functions characterizing random behavior of deterministic oscillators. (For the entire collection see MR 81a:92002.)
  Reviewer: Ames, W. F. (Atlanta, Ga.)
  Review Type: Signed review
  Proceedings Reference: 81a#92002; 564 910
  Descriptors: *34C15 -Ordinary differential equations-Qualitative theory (See also 58Fxx)-Nonlinear oscillations ; 58F13 -Global analysis, analysis on manifolds (See also 32Cxx, 32Fxx, 46-XX, 47Hxx, 53Cxx; for geometric integration theory, see 49Q15)-Ordinary differential equations on manifolds; dynamical systems (See also 28D10, 34Cxx, 54H20)-Strange attractors; chaos and other pathologies (See also 70K50)

1/5/269 (Item 59 from file: 239)
DIALOG(R)File 239:Mathsci

01612000 MR 81a#92002
Nonlinear oscillations in biology.
  Proceedings of the Tenth Summer Seminar on Applied Mathematics held at the University of Utah, Salt Lake City, Utah, June 12--23, 1978. Edited by Frank C. Hoppensteadt.
  Contributors: **Hoppensteadt, Frank C.**
  Publ: American Mathematical Society, Providence, R.I.,
  1979, x+253 pp. ISBN: 0-8218-1117-7
  Series: Lectures in Applied Mathematics, 17.
  Price: $29.20.
  Language: English
  Document Type: Book; Proceedings
  Journal Announcement: 1215
  Nonlinear oscillations in biology; Summer Seminar: Applied Mathematics,; Biology; Salt Lake City, Utah, 10th 1978
  Subfile: MR (Mathematical Reviews) AMS
  Abstract Length: MEDIUM (12 lines)
  Contents: Frank C. Hoppensteadt, Foreword (pp. ix - x); Louis N. Howard, Nonlinear oscillations (pp. 1 - 67); Charles R. Steele, Studies of the ear (pp. 69 - 91); Arthur Winfree, 24 hard problems about the mathematics of 24 hour rhythms (pp. 93 - 126); Donald Ludwig, Stochastic modelling and nonlinear oscillations (pp. 127 - 129); Frank C. Hoppensteadt, Computer studies of nonlinear oscillators (pp. 131 - 139); O. E. Rossler, Chaotic oscillations: an example of hyperchaos (pp. 141 - 156); Jack K. Hale, Nonlinear oscillations in equations with delays (pp. 157 - 185); John Guckenheimer, A brief introduction to dynamical systems (pp. 187 - 253). (Most of the papers are being reviewed individually.)
  Reviewer: Editors
  Review Type: Table of contents
  Descriptors: *92-06 -Biology and other natural sciences, behavioral sciences-Proceedings, conferences, collections, etc. ; 34-06 -Ordinary differential equations-Proceedings, conferences, collections, etc.; 58-06 -Global analysis, analysis on manifolds (See also 32Cxx, 32Fxx, 46-XX, 47Hxx, 53Cxx; for geometric integration theory, see 49Q15)-Proceedings, conferences, collections, etc.

1/5/270 (Item 60 from file: 239)
DIALOG(R)File 239:Mathsci

01606210 CIS 8104143
Threshold analysis of a drug use epidemic model
 Hoppensteadt, F. C.
  Murray, J. D.
  Math. Biosci. MaBiosci (CIS abbrev)

Mathematical Biosciences. An International Journal, 1981, 53, 79--87 ISSN: 0025-5564 CODEN: mabiar
Language: English
Document Type: Journal
Subfile: CIS (Current Index to Statistics) ASA/IMS

1/5/271 (Item 61 from file: 239)
DIALOG(R)File 239:Mathsci

01574634 MR 80b#92015
Slow selection analysis of genetic traits in synchronized populations.
Conference on Deterministic Differential Equations and Stochastic Processes Models for Biological Systems (San Cristobal, N.M., 1977).
Hoppensteadt, F. C.
Rocky Mountain J. Math.
The Rocky Mountain Journal of Mathematics, 1979, 9, no. 1, 93--97. ISSN: 0035-7596 CODEN: RMJMAE
Language: English
Document Type: Journal
Journal Announcement: 1110
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (15 lines)
The behaviour over time is considered for the frequencies of the gamete types for a genetic structure taken to be two autosomal loci each having two alleles in a diploid population. The population is taken to be synchronized in the sense that all reproductions occur at once followed by the removal of parents. Selection is assumed to act over a much longer time scale than reproduction. The first result is that when selection is slow and linkage right, Fisher's fundamental theorem of natural selection holds, namely the population's genetic structure changes in such a way as to increase its fitness. The second result is that the effects of slow selection and loose linkage on a population initially at linkage equilibrium are such that the fundamental theorem can only be verified after an initial transient period in which the gamete frequencies equilibrate to a certain functional form.
Reviewer: Wilson, Susan (Canberra)
Review Type: Signed review
Descriptors: *92A10 -Biology and other natural sciences, behavioral sciences-Genetics

1/5/272 (Item 62 from file: 239)
DIALOG(R)File 239:Mathsci

01506395 MR 58##26165
A nonlinear renewal equation with periodic and chaotic solutions.
Asymptotic methods and singular perturbations (Proc. SIAM-AMS Sympos. Appl. Math., New York, 1976)
Hoppensteadt, Frank C.
1976,
Amer. Math. Soc., Providence, R.I.,; pp. 51--60. SIAM-AMS Proceedings, Vol. X,,
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (14 lines)
Author's summary: ``A nonlinear renewal equation which arises in several areas of mathematical population theory is studied by a combination of mathematical and numerical analysis. The model is characterized by two parameters: m, a measure of the population's viability and fertility and μ, the (normalized) length of the population's reproductive window. Solutions are described for all values of these parameters, $0\leq m\leq 4$, $0\leq\mu\leq 1$, by a combination of multi-time perturbation analysis and numerical solution. In various regions, the solutions are shown to be

described by Burgers' equation, a Korteweg-de Vries equation and by a nonlinear difference equation. Numerical methods are used to investigate the remaining regions.''
\{For the entire collection see MR 58\#15769.\}
Reviewer: Author's summary
Review Type: Abstract
Descriptors: *92A15 -Biology and other natural sciences, behavioral sciences-Population dynamics, epidemiology

1/5/273 (Item 63 from file: 239)
DIALOG(R)File 239:Mathsci

01506394 MR 58##26164
Mathematical theories of populations: demographics, genetics and epidemics.
Regional Conference Series in Applied Mathematics.
Hoppensteadt, Frank
Publ: Society for Industrial and Applied Mathematics, Philadelphia, Pa., 1975, vii+72 pp.
Price: $7.05.
Language: English
Document Type: Book
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (33 lines)
From the preface: ``The monograph begins with a study of population age structure. A basic model is derived first, and it reappears frequently throughout the remainder. Various extensions and modifications of the basic model are then applied to several population phenomena, such as stable age distributions, self-limiting effects and two-sex populations. The second part is devoted to population genetics, and it contains a summary of some of the most successful applications of mathematics in the biological sciences. Attention is focused on the derivation and analysis of a model for a one-locus, two-allele trait in a large randomly mating population. Then extensions of the system are considered which account for more complicated social structure (assortative mating and migration) and for age structure. This part ends with a description of Fisher's model for the propagation of a gene in a spatially distributed population, and stable gene waves are shown to exist. A reason for the success of mathematical theories in genetics has been the abundance of precise collectable data. Unfortunately, this is not the case in the topics discussed in Parts I and III. The final part, Part III, is concerned with the dynamics of contagious phenomena in a population. These are studied in the context of epidemic diseases, but the same methods can be used to describe other phenomena such as rumors, fads and information as well as models for two interacting systems. Several classic examples are discussed first, then a general age-dependent theory is formulated. However, the emphasis in Part III is placed on studies of qualitative properties of several typical models. First, a threshold theorem is derived for an age-dependent epidemic, and then the long time behavior of solutions to a relapse-recovery model is determined. Finally, models for the spatial spread of contagion are derived and extensively discussed.''
Reviewer: From the preface
Review Type: Abstract
Descriptors: *92A15 -Biology and other natural sciences, behavioral sciences-Population dynamics, epidemiology

1/5/274 (Item 64 from file: 239)
DIALOG(R)File 239:Mathsci

01497283 MR 58##17324
Frequency entrainment of a forced van der Pol oscillator.
Flaherty, J. E.
Hoppensteadt, F. C.

Studies in Appl. Math.
1978, 58, no. 1, 5--15.
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (14 lines)

This is an interesting study of a van der Pol relaxation oscillator subject to external sinusoidal forcing: $$ (d\sp 2u/dt\sp 2)+k(u\sp 2-1)(du/dt)+u=\mu kB\cos(\mu t+\alpha). $$ The model is studied for the parameters satisfying $\alpha=0$, $\mu=1$, $0<B<0.8$, $0<1/k<0.2$. The numerical computing of the rotation number (ρ) suggests that it defines a continuous but piecewise constant surface except in overlap regions where it is double-valued, having what looks like folds. The parameter ranges where ρ is single-valued illustrate the phenomenon of locking phase, the successive bifurcation of stable subharmonic and almost periodic oscillations. The paper gives an indication of the nature of stable responses of this system, which poses difficult analytic problems.

Reviewer: Hmelevskaja-Plotnikov, G. V. (Jambes)
Review Type: Signed review
Descriptors: *34C15 -Ordinary differential equations-Qualitative theory (See also 58Fxx)-Nonlinear oscillations ; 70.34 -Mechanics of particles and systems (For relativistic mechanics, see 83A05 and 83C10; for statistical mechanics, see 82-XX)

1/5/275 (Item 65 from file: 239)
DIALOG(R)File 239:Mathsci

01489186 MR 58##9413

Optimal exploitation of a spatially distributed fishery.

New trends in systems analysis (Proc. Internat. Sympos., Versailles, 1976)

Hoppensteadt, Frank C.

1977,
Springer, Berlin,; pp. 3--18. Lecture Notes in Control and Informat. Sci., Vol. 2,,
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (22 lines)

Consider a fish population of density $u(x,t)$ at time t, where x is the distance to that boundary of the habitat bordering a breeding ground. In this one-dimensional model, the second boundary $x=X$ is assumed to adjoin an unfavorable environment. The dynamical boundary condition at $x=0$ is of the form $\partial u/\partial x=-A(u)=0$ if $\int\sb 0\sp Xu(x,t)\,dx<T$, and $\partial u/\partial x=-A(u)=-A$ if $\int\sb 0\sp Xu(x,t)\,dx\geq T$, where T is a threshold parameter. A zero flux boundary condition prevails at the hostile boundary.

If a bang-bang principle motivates the harvest effort, then a free boundary (stop-harvest) of the form $x=S(t)$ appears on either side of which distinct diffusion relations hold, and on which a zero revenue relation holds. This is, of course, reminiscent of a two-phase Stefan problem of heat conduction.

The author discusses in detail equilibrium solutions of this dynamical problem and relates this analysis to various important qualitative questions such as harvesting quotas, competition and ultimate fishery collapse. In particular, threshold parameters are derived for the onset of collapse. A number of other questions are also discussed in this brief but interesting paper.

\{For the entire collection see MR 57\#5216.\}

Reviewer: Jerome, J. W. (Evanston, Ill.)
Review Type: Signed review
Descriptors: *92A15 -Biology and other natural sciences, behavioral sciences-Population dynamics, epidemiology

1/5/276 (Item 66 from file: 239)
DIALOG(R)File 239:Mathsci

01483621 MR 58##3972
Dynamics of the Josephson junction.
Levi, M.
Hoppensteadt, F. C.
Miranker, W. L.
(Levi, Mark)
Quart. Appl. Math.
1978, 36, no. 2, 167--198.
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: SHORT (8 lines)
The jump in the electron wave function across the junction gap is studied by considering the sine-Gordon equation. This analysis is performed for the current-driven case. Replacement of the derivatives by divided differences gives the discrete version of this problem. A numerical analysis of the static solutions, including their stability, is described, and the existence of a running periodic solution for both the discrete and continuous cases is proved.
Reviewer: Sips, Vladimir (Zagreb)
Review Type: Signed review
Descriptors: *78.35 -Optics, electromagnetic theory (For quantum optics, see 81V80) ; 80.35 -Classical thermodynamics, heat transfer (For thermodynamics of solids, see 73B30)

1/5/277 (Item 67 from file: 239)
DIALOG(R)File 239:Mathsci

01477378 MR 57##17053
Periodic solutions of a logistic difference equation.
Hoppensteadt, F. C.
Hyman, J. M.
SIAM J. Appl. Math.
1977, 32, no. 1, 73--81.
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (22 lines)
Consider a logistic difference equation $(*)$ $x\sb {n+1}=mx\sb n(1-x\sb n)$, where m is a nonnegative real number. Since the authors are interested in the solution of $(*)$ that lies in the unit interval, they examine equation $(*)$ only for values of m satisfying $0\leq m\leq 4$. Under this condition, by employing simple geometric arguments and numerical computations, they study periodic solutions of equation $(*)$. They show that as m increases from zero, solutions having successively higher periods branch from old ones until the value $m\doteq 3.57$ is reached, after which there is an infinity of periodic solutions. The authors also make an interesting study of the behavior of the solution of $(*)$ in the chaotic regime. In fact, it is shown how, as m increases from 3.57, solutions having various other periods are added to the solution set until, at $m\doteq 3.83$, solutions of period three, and so solutions of all periods, are present. Furthermore, in order to study the dynamics of solutions in portions of the chaotic regime, the authors give numerical calculations for the density functions. In the present work, the authors have used an interesting result due to T. Li and J. Yorke [Amer. Math. Monthly 82 (1975), no. 10, 985--992; MR 52\#5898].
Reviewer: Ladde, G. S. (Potsdam, N.Y.)
Review Type: Signed review
Descriptors: *39A10 -Finite differences and functional equations-Difference equations (For dynamical systems, see 58Fxx)-Difference equations (See also 33Dxx) ; 58F15 -Global analysis, analysis on manifolds

(See also 32Cxx, 32Fxx, 46-XX, 47Hxx, 53Cxx; for geometric integration theory, see 49Q15)-Ordinary differential equations on manifolds; dynamical systems (See also 28D10, 34Cxx, 54H20)-Hyperbolic structures (expanding maps, Anosov systems, etc.); 92A15 -Biology and other natural sciences, behavioral sciences-Population dynamics, epidemiology

1/5/278 (Item 68 from file: 239)
DIALOG(R)File 239:Mathsci

01468543 MR 57##8416
An analysis of transient behavior in the onset of convection.
Singular perturbations and boundary layer theory (Proc. Conf., Ecole Centrale, Lyon, 1976)
Gordon, Noam
Hoppensteadt, Frank C.
1977,
Springer, Berlin,; pp. 231--243. Lecture Notes in Math., Vol. 594,,
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (13 lines)

The bifurcation of convective motion for a viscous, incompressible fluid contained between horizontal parallel plates is studied using matched asymptotic expansions for an associated ordinary differential equation in an abstract space. The perturbation series is rigorously justified on the basis of previous work of the authors [Comm. Pure Appl. Math. 28 (1975), no. 3, 355--373; MR 54\#5927]. The series obtained is similar to those derived by earlier workers and the novelty of this work lies in its rigorous justification. Only the cases of ``rolls'' or a singly periodic disturbance are dealt with, although the authors state that the other cases may be dealt with analogously.

\{For the entire collection see MR 56\#810.\}

Reviewer: Elcrat, A. (Wichita, Kan.)
Review Type: Signed review
Descriptors: *76.41 -Fluid mechanics (For general continuum mechanics, see 73Bxx, or other parts of 73-XX) ; 35Q10 -Partial differential equations -Equations of mathematical physics and other areas of application (See also 35J05, 35J10, 35K05, 35L05)-Navier-Stokes equations (See also 76D05)

1/5/279 (Item 69 from file: 239)
DIALOG(R)File 239:Mathsci

01463555 MR 57##3524
Iterated averaging methods for systems of ordinary differential equations with a small parameter.
Persek, S. C.
Hoppensteadt, F. C.
Comm. Pure Appl. Math.
1978, 31, no. 2, 133--156.
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (33 lines)

The method of averaging in its simplest form applies to a vector differential equation $\dot x=\varepsilon f(x,t,\varepsilon)$ (where ε is a small parameter and f is periodic in t) and consists in replacing f by its average over t and asserting that the resulting solutions are a good approximation to the exact solutions. The first-order average is not always an adequate approximation, especially when some components of the average of f vanish, and one may construct higher-order averaged equations whose solutions give better approximations [see L. Perko, SIAM J. Appl. Math. 17 (1968), 698--724; MR 41\#2129]. The present authors establish asymptotic validity of what is essentially a second-order

averaging method under various circumstances, sometimes on expanding intervals of time and sometimes on infinite intervals. The setting is $\dot w=\varepsilon E(w,x,y,z,t,\varepsilon)$, $\dot x=\varepsilon F(w,x,y,z,t,\varepsilon)$, $\dot y=\varepsilon G(w,x,y,z,t,\varepsilon)$, $\dot z=A(t)z+\varepsilon H(w,x,y,z,t,\varepsilon)$, where w,x,y,z are vectors, $A(t)$ is a matrix such that all solutions of $\dot z=A(t)z$ approach zero exponentially, and E,F,G are quasiperiodic in t and decompose into sums of periodic functions. It is explicitly assumed that the time average of E vanishes; a second-order average is calculated for the w components only, which vary on the extra-slow time scale $\varepsilon\sp 2t$, the first order sufficing otherwise. Applications are given, including an approximation to transient solutions in a Hopf bifurcation problem. Simpler proofs (along the lines of Perko) could probably be given for some of the results of this paper, at least for expanding intervals of length $O(1/\varepsilon)$; however results are obtained here on intervals of length $O(1/\varepsilon\sp 2)$, and the proofs are designed to be applicable in a partial differential equations setting as well.

Reviewer: Murdock, James A. (Ames, Iowa)
Review Type: Signed review
Descriptors: *34C30 -Ordinary differential equations-Qualitative theory (See also 58Fxx)-Manifolds of solutions ; 34C25 -Ordinary differential equations-Qualitative theory (See also 58Fxx)-Periodic solutions

1/5/280 (Item 70 from file: 239)
DIALOG(R)File 239:Mathsci

01461945 MR 57##1941
Multitime methods for systems of difference equations.
Hoppensteadt, Frank C.
Miranker, Willard L.
Studies in Appl. Math.
1976, 56, no. 3, 273--289.
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (18 lines)

The authors develop a constructive perturbation scheme which reduces the problem of determining behavior of solutions of a perturbed difference system to that for an associated system of ordinary differential equations via an averaging procedure. The general system treated has the form $x(m+1)=Ax(m)+\varepsilon f(x(m),\varepsilon)$. Assumptions are that A is similar to a block diagonal matrix containing one oscillatory block and one stable block, that the part of the solution corresponding to the stable block has a smooth solution, and that the appropriate average exists smoothly.

Particular results are obtained for the linear one-and two-parameter systems $x(m+1)=(A+\varepsilon B+\mu C)x(m)$. The method developed is applied to examples including a population genetics model, a training algorithm in pattern recognition, and the numerical analysis of a stiff differential equation. Results obtained are similar to those obtained by the authors for differential equations [J. Differential Equations 22 (1976), no. 2, 237--249; MR 54\#10777].

Reviewer: Berkey, Dennis D. (Boston, Mass.)
Review Type: Signed review
Descriptors: *65Q05 -Numerical analysis-Difference and functional equations, recurrence relations

1/5/281 (Item 71 from file: 239)
DIALOG(R)File 239:Mathsci

01456602 MR 56##14827
Mathematical methods of population biology.

Hoppensteadt, F. C.
Publ: Courant Institute of Mathematical Sciences, New York University, New York,
1977, v+167 pp.
Price: $5.25.
Language: English
Document Type: Book
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (33 lines)

This is a survey of problems and mathematical methods of population biology. The choice of topics and emphasis is, in this reviewer's opinion, rather idiosyncratic. If used as a text, these notes would require substantial amplification in places, and references are also scanty. However, mathematically inclined readers will find a wealth of ideas and insights.

Chapter I begins with a discussion of the dynamics of a single population, with emphasis on linear models. This theme is taken up again in Chapter V, where age structured models are presented, including Leslie matrices and stable age distributions. Chapter I closes with an introduction to the theory of exploitation of populations.

Chapter II is entitled Mathematical Ecology. It is a brief account of the periodic cicada, and of the spruce budworm. This must be the first work on population-ecology which does not mention the Lotka-Volterra equations, not even to point out that they are structurally unstable. In fact, there is no discussion of interacting species at all.

Chapter III is concerned with contagion, i.e., the spread of infectious disease. It discusses the Reed-Frost and Kermack-McKendrick models, and presents some threshold results. Genetic models are treated in Chapter IV, VI and VII. These are all of the one or two locus variety. The simplest case of bacterial plasmid inheritance is dealt with first. Then deterministic theories for one locus with two or three alleles are presented, followed by two loci, with two alleles each. Finite populations, where random sampling effects appear, are dealt with in Chapter VII. Emphasis is placed upon branching process approximations, and diffusion approximations.

The final chapter is devoted to spatial effects. Linear and nonlinear diffusion models are presented. Topics include critical patch size for phytoplankton, diffusive instability, travelling waves, and genetic clines.

Reviewer: Ludwig, D. (Vancouver, B.C.)
Review Type: Signed review
Descriptors: *92A15 -Biology and other natural sciences, behavioral sciences-Population dynamics, epidemiology

1/5/282 (Item 72 from file: 239)
DIALOG(R)File 239:Mathsci

01447824 MR 56##6120
Slowly modulated oscillations in nonlinear diffusion processes.
Cohen, Donald S.
Hoppensteadt, Frank C.
Miura, Robert M.
SIAM J. Appl. Math.
1977, 33, no. 2, 217--229.
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (28 lines)

As an example of a more general type of nonlinear diffusion equation, the authors discuss in detail the system $\partial u/\partial t=\theta\sb 1(\partial\sp 2u/\partial x\sp 2)+\alpha(\lambda)u-\beta v-\lambda u\sp 3$, $\partial v/\partial t=\theta\sb 2(\partial\sp 2v/\partial x\sp 2)+\beta u+\gamma(\lambda)v-\mu\lambda u\sp 2v$, where u and v are functions of x and t, $\theta\sb 1$ and $\theta\sb 2$ are diffusion coefficients, β and μ are positive constants and λ is a parameter. For $\lambda=\lambda\sb 0$, $\alpha(\lambda\sb

0)=0=\gamma(\lambda\sb 0)$ and---neglecting diffusion---the system has a stable equilibrium point at $u=0$, $v=0$. It is assumed that, for λ close to $\lambda\sb 0$, $\alpha(\lambda)=\varepsilon\sp 2\alpha\sb 2+O(\varepsilon\sp 3)$ and $\gamma(\lambda)=\varepsilon\sp 2\gamma\sb 2+O(\varepsilon\sp 3)$, where $\varepsilon=\lambda-\lambda\sb 0$ and $\alpha\sb 2,\gamma\sb 2$ are positive constants. This implies that---neglecting diffusion---the equilibrium point is unstable for ε non-zero.

Under these circumstances, the authors look for a finite amplitude solution for the full equation, including diffusion, of the form $u=R(\eta)\cos\{\beta t\sp \ast+\phi(\eta)\}$, $v=R(\eta)\sin\{\beta t\sp \ast+\phi(\nu)\}$, where $\eta=\varepsilon(x-\varepsilon ct)$ and $t\sp \ast/t=1+O(\varepsilon)$, with c constant. Thus R gives a slowly varying amplitude and ϕ a slowly varying phase angle for the sinusoidal oscillation. The authors show that a solution of this kind is possible and indicate that similar solutions can occur in the more general case.

Reviewer: Brown, Archibald (Canberra)
Review Type: Signed review
Descriptors: *35K40 -Partial differential equations-Parabolic equations and systems (See also 35Bxx, 35Dxx, 35R30, 35R35, 58G11)-General theory of parabolic systems of PDE ; 80.35 -Classical thermodynamics, heat transfer (For thermodynamics of solids, see 73B30)

1/5/283 (Item 73 from file: 239)
DIALOG(R)File 239:Mathsci

01442448 MR 56##810
Singular perturbations and boundary layer theory.
Proceedings of the Conference held at the Ecole Centrale de Lyon, Lyon, December 8--10, 1976. Edited by C. M. Brauner, B. Gay and J. Mathieu. Lecture Notes in Mathematics, Vol. 594.
Contributors: Brauner, C. M.; Gay, B.; Mathieu, Jean; **Hoppensteadt, Frank C.** ; Miranker, Willard L.
Publ: Springer-Verlag, Berlin-New York,
1977, vii+539 pp.
Language: English
Document Type: Book
Singular perturbations and boundary layer theory; Conference: Singular Perturbations and Boundary Layer Theory; Boundary layer theory; Lyon, (Proc. Conf., Ecole Centrale, Lyon, 1976) (Ecole Centrale, Lyon, 1976) 1976
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (63 lines)
Table of Contents: Preface (pp. iii-iv); J. Baranger, Estimations d'erreur a l'interieur pour un probleme de couche limite (pp. 1--9); A. Bensoussan, J. L. Lions and G. Papanicolaou, Perturbations et ``augmentation'' des conditions initiales (pp. 10--29); Yu. A. Berezin [Ju. A. Berezin], G. I. Dudnikova, V. A. Novikov and N. N. Yanenko [N. N. Janenko], Analytical and numerical studies of equations with sign changing viscosity coefficient (pp. 30--38); A. Bourgeat and R. Tapiero, Calcul de correcteurs pour un probleme de couche limite provenant de la physique du plasma (pp. 39--49); C. M. Brauner and B. Nicolaenko, Singular perturbation, multiple solutions and hysteresis in a nonlinear problem (pp. 50--76); J. S. Darrozes, Comportement singulier des ecoulements a grand nombre de Reynolds au voisinage du bord d'attaque d'une aile mince (pp. 77--107); A. S. Demidov, Sur les problemes elliptiques pseudo-differenciels, a petit parametre dans l'operateur principal (pp. 108--122); A. S. Demidov, Sur la perturbation ``singuliere'' dans un probleme a frontiere libre (pp. 123--130); G. Duvaut, Comportement macroscopique d'une plaque perforee periodiquement (pp. 131--145); Wiktor Eckhaus, Matching principles and composite expansions (pp. 146--177); Ph. Gatignol, Theorie asymptotique des trains d'ondes lentement modules pour certaines classes d'equations de conservation (pp. 178--200); J. Genet and M. Madaune, Perturbations singulieres pour une classe de problemes hyperboliques non lineaires (pp. 201--230); Noam Gordon and Frank C.

Hoppensteadt, An analysis of transient behavior in the onset of convection (pp. 231--243); Jean-Pierre Guiraud, The dynamics of rolled vortex sheets tightly wound around slender vortex filaments in inviscid incompressible flow (French summary) (pp. 244--259); Maurice Holt and Mohammed Y. Hussaini, Laminar wakes in supersonic flow (pp. 260--274); Frank C. Hoppensteadt and Willard L. Miranker, Applications of multi-time methods to pattern recognition and other problems (pp. 275--287); Denise Huet, Perturbations singulieres de problemes elliptiques (pp. 288--300); Th. Levy, Equations et conditions d'interface pour des phenomenes acoustiques dans des milieux poreux (pp. 301--311); Pierre Louvet and Jean Durivault, Compressible countercurrent flow in a strongly rotating cylinder pp. 312--333); John L. Lumley, Some applications of singular perturbations to problems in fluid mechanics (pp. 334--350); J. Mathieu and B. Gay, Quelques problemes asymptotiques en theorie de la couche limite (pp. 351--364); F. Mignot and J. P. Puel, Un resultat de perturbations singulieres dans les inequations variationnelles (passage du 2$\sp {\text{\`eme}}$ ordre au 1$\sp {\text{er}}$ ordre) (pp. 365--399); F. Obermeier, The application of singular perturbation methods to aerodynamic sound generation (pp. 400--421); R. E. O'Malley, Jr. and J. E. Flaherty, Singular singular-perturbation problems (pp. 422--436); E. Sanchez-Palencia, Perturbations spectrales liees a la vibration d'un corps elastique dans l'air (pp. 437--455); D. Brian Spalding, Numerical computation of steady boundary layers (pp. 456--473); Luc Tartar, Homogeneisation en hydrodynamique (pp. 474--481); V. A. Trenogin, On the theory of abstract elliptical equations containing a singular perturbation (pp. 482--490); V. A. Trenogin and N. A. Sidorov, Regularisation of computation of branching solutions of nonlinear equations (pp. 491--505); Milton Van Dyke, From zero to infinite Reynolds number by computer extension of Stokes series (pp. 506--517); R. Kh. Zeytounian, Les modeles de couche limite en dynamique de l'atmosphere (pp. 518--539).

\{The papers of mathematical interest will be reviewed individually.\}

Reviewer: Editors

Review Type: Abstract

Descriptors: *35-06 -Partial differential equations-Proceedings, conferences, collections, etc.

1/5/284 (Item 74 from file: 239)

DIALOG(R)File 239:Mathsci

01436621 MR 55##9544

Numerical methods for stiff systems of differential equations related with transistors, tunnel diodes, etc.

Computing methods in applied sciences and engineering (Proc. Internat. Sympos., Versailles, 1973), Part 1

Miranker, Willard L.

Hoppensteadt, Frank

1974,

Springer, Berlin,; pp. 416--432. Lecture Notes in Comput. Sci., Vol. 10,,

Language: English

Document Type: Journal

Subfile: MR (Mathematical Reviews) AMS

Abstract Length: MEDIUM (22 lines)

The authors consider systems of ordinary differential equations whose solutions are composed of slowly varying components, highly damped components, highly oscillatory components and combinations of these. Such stiff systems arise, for example, in models of circuits containing transistors or tunnel diodes. A relationship between stiff differential equations and differential equations with singular perturbations, discovered by Miranker, is used to develop numerical schemes for the solution of stiff equations.

First, the multitime technique of asymptotic expansions is combined with the method of averaging of Bogoljubov to produce a procedure for deriving the asymptotic form of solutions to singularly perturbed differential equations over the full indicated range of solution behavior. A new concept

is then introduced for the numerical solution of differential equations. A quantity is accepted as an approximation to the solution at a point in time of the quantity approximates any value which the solution assumes on a neighborhood if that point in time, the size of the neighborhood being arbitrary but positive. With this new concept of a numerical solution, a numerical method is constructed based on the asymptotic theory developed earlier.

\{For the entire collection see MR 49\#4197.\}

Reviewer: Katz, I. Norman

Review Type: Signed review

Descriptors: *65L05 -Numerical analysis-Ordinary differential equations-Initial value problems ; 94A20 -Information and communication, circuits-Communication, information-Circuits, networks; applications of graph theory and Boolean algebra; 34E15 -Ordinary differential equations-Asymptotic theory-Singular perturbations, general theory

1/5/285 (Item 75 from file: 239)

DIALOG(R)File 239:Mathsci

01422811 MR 54##10777

Differential equations having rapidly changing solutions: analytic methods for weakly nonlinear systems.

Hoppensteadt, F. C.

Miranker, Willard L.

J. Differential Equations

1976, 22, no. 2, 237--249.

Language: English

Document Type: Journal

Subfile: MR (Mathematical Reviews) AMS

Abstract Length: MEDIUM (13 lines)

The authors derive an approximation to the solution of the initial value problem (1) $dx/d\tau=\varepsilon F(\tau,t,x,y,\varepsilon)$, $dy/d\tau=A\{\tau)y+\varepsilon G(\tau,t,x,y,\varepsilon)$, $x(0)=\xi(\varepsilon)$, $y(0)=\eta(\varepsilon)$, where ε is a small parameter $t=\varepsilon\tau,x,\xi$, $F\in E\sp m$, y,η, $G\in E\sp n$ and $A\in E\sp {n\times n}$. The solution of (1) is considered in the form $x=X\sb 0(\tau,t)+\varepsilon X\sb 1(\tau,t,\varepsilon)$, $y=Y\sb 0(\tau,t)+\varepsilon Y\sb 1(\tau,t,\varepsilon)$, and it is shown that under suitable assumptions $X\sb 1$ and $Y\sb 1$ are smooth functions that remain bounded uniformly in ε for $\tau\in[0,T/\varepsilon]$, $t\in[0,T]$.

Reviewer: Rab, M.

Review Type: Signed review

Descriptors: *34E05 -Ordinary differential equations-Asymptotic theory-Asymptotic expansions

1/5/286 (Item 76 from file: 239)

DIALOG(R)File 239:Mathsci

01422810 MR 54##10776

Analysis of some problems having matched asymptotic expansion solutions.

Hoppensteadt, Frank

SIAM Rev.

1975, 17, 123--135.

Language: English

Document Type: Journal

Subfile: MR (Mathematical Reviews) AMS

Abstract Length: MEDIUM (17 lines)

The author discusses the capabilities and limitations of the method of matched asymptotic expansions for the solution of evolution equations. The method is well known to be a highly useful heuristic in the qualitative analysis of physical problems. The author presents a number of cases in which the method has been shown to be mathematically rigorous---an area to

which he has been a major contributor. The results are listed according to spectral properties of the linear part of the problem resulting from scaling near a known steady state. The author shows that, when the linear problem is stable, the solution can be written as a finite sum of terms; each responding on a different time scale. He also shows that, when the linear problem is unstable, the method can be used to determine initial data that excite only decaying modes, and, in the case of bifurcation of new steady states, to construct the new states as well as the transients to them. The bibliography lists thirty-five useful references.

Reviewer: Greenlee, W. M.

Review Type: Signed review

Descriptors: *34E05 -Ordinary differential equations-Asymptotic theory-Asymptotic expansions ; 34G05 -Ordinary differential equations-Differential equations in abstract spaces (See also 58D25)-Differential equations in Banach and other abstract spaces (See also 47Bxx.); 35B40 -Partial differential equations-Qualitative properties of solutions-Asymptotic behavior of solutions

1/5/287 (Item 77 from file: 239)

DIALOG(R)File 239:Mathsci

01417900 MR 54##5927

Nonlinear stability analysis of static states which arise through bifurcation.

Hoppensteadt, Frank

Gordon, Noam

Comm. Pure Appl. Math.

1975, 28, no. 3, 355--373.

Language: English

Document Type: Journal

Subfile: MR (Mathematical Reviews) AMS

Abstract Length: MEDIUM (20 lines)

The authors consider the initial value problem $du/dt=Bu+F(u,\varepsilon)$, $u(0)=u(\varepsilon)$, where u is an element of some Banach space E, the linear operator B is a densely defined (possibly unbounded) operator acting in E, and F is some nonlinear operator. It is known that if the spectrum of B lies in the stable half-plane, then the solution of the system can be written as the sum of a solution which is a smooth function of ε at $\varepsilon=0$ (called the outer solution) and a function depending on t and ε (called the initial correction) which decays exponentially as $t\rightarrow\infty$.

In this paper the authors study the above nonlinear problems when B has a finite dimensional null-space. They use an extension of the method of matched asymptotic expansions, derived in the second author's dissertation, and show that the solutions of the problem can be written as the sum of an outer solution and an initial correction. But there may be several outer solutions and the one pertinent to the above nonlinear problem is determined by the position of the initial data relative to the domains of attraction of these various choices.

Reviewer: Kannan, R.

Review Type: Signed review

Descriptors: *47H15 -Operator theory-Nonlinear operators (For global and geometric aspects, see 58-XX, especially 58Cxx)-Equations involving nonlinear operators (See also 58E07 for abstract bifurcation theory) ; 34G05 -Ordinary differential equations-Differential equations in abstract spaces (See also 58D25)-Differential equations in Banach and other abstract spaces (See also 47Bxx.); 58E99 -Global analysis, analysis on manifolds (See also 32Cxx, 32Fxx, 46-XX, 47Hxx, 53Cxx; for geometric integration theory, see 49Q15)-Variational problems in infinite-dimensional spaces-None of the above, but in this section

1/5/288 (Item 78 from file: 239)

DIALOG(R)File 239:Mathsci

01412567 MR 54##668
Solutions near bifurcated steady states.
International Conference on Differential Equations (Proc., Univ. Southern California, Los Angeles, Calif., 1974)
Hoppensteadt, F.
1975,
Academic Press, New York,; pp. 363--369.,
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (17 lines)
The author uses an example to illustrate the application of two-timing methods to bifurcation near a steady state. He begins with the two-dimensional system $\dot x=T(x,y,\lambda)$, $\dot y=G(x,y,\lambda)$, and linearizes about the steady state (λ_0,x_0,y_0). He assumes that the coefficient matrix of the linear part is of the form $\text{diag}(0,a)$, so that the new system is $\dot u=F(u,v,\varepsilon)$, $\dot v=av+G(u,v,\varepsilon)$, with steady state $(0,0,0)$. Nearby (in ε) steady states will satisfy the condition $F(u,v,\varepsilon)=0$, $av+G(u,v,\varepsilon)=0$, and the latter yields $v=v^\ast(u,\varepsilon)$. This is substituted into the first equation, and this equation is solved by asymptotic procedures. The author discusses the details when the initial states $u(0,\varepsilon)$ and $v(0,\varepsilon)$ are restricted. The result is an existence and uniqueness theorem, with asymptotic estimates.
\{For the entire collection see MR 51\#966.\}
Reviewer: Macki, J. W.
Review Type: Signed review
Descriptors: *34E10 -Ordinary differential equations-Asymptotic theory-Perturbations, asymptotics

1/5/289 (Item 79 from file: 239)
DIALOG(R)File 239:Mathsci

01411709 MR 53##15417
A slow selection analysis of two locus, two allele traits.
Hoppensteadt, Frank C.
Theoret. Population Biology
1976, 9, no. 1, 68--81.
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (19 lines)
The author derives a deterministic, continuous-time model for the dynamics of two-locus, two-allele Mendelian traits in a large randomly mating diploid population. The model allows for frequency and time dependent birth and death rates. It is analyzed under the assumption that the selective forces acting in the population are small. Slow selection approximations to the system's solutions are then constructed. Two particular cases are studied. First, when linkage between loci is tight, the population is shown to rapidly approach Hardy-Weinberg proportions, which then may vary on a (slow) time scale determined by differential fitness. In the case of constant birth and death rates, a measure of the population's fitness is shown to increase on the slow time scale after an initial rapid adjustment. The second case considered is for loose linkage; a population near linkage equilibrium is studied. It is shown that the epistatic parameters cancel and that the results agree with the tight linkage case up to the leading order. The linkage disequilibrium is described in both cases.
Reviewer: Wilson, Susan
Review Type: Signed review
Descriptors: *92A10 -Biology and other natural sciences, behavioral sciences-Genetics

1/5/290 (Item 80 from file: 239)
DIALOG(R)File 239:Mathsci

01395954 MR 52##16722
Analysis of a stable polymorphism arising in a selection-migration model in population genetics.
Hoppensteadt, F. C.
J. Math. Biol.
1975, 2, no. 3, 235--240.
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: SHORT (9 lines)
Author's summary: ``We study the dynamic behaviour of a population in which there is a geographic variation in fitness of a one-locus, two-allele trait. The results derived here complement certain results by W. H. Fleming [J. Math. Biol. 2 (1975), no. 3, 219--233; MR 53\#7531 who described the existence of a stable polymorphism when the ratio of selection intensity to dispersion rate exceeds a critical value. Here an approximation to the polymorphic state is obtained, and the evolution of other initial states to it is studied.''
Reviewer: Bruter, C. P.
Review Type: Signed review
Descriptors: *92A15 -Biology and other natural sciences, behavioral sciences-Population dynamics, epidemiology ; 35KXX -Partial differential equations

1/5/291 (Item 81 from file: 239)
DIALOG(R)File 239:Mathsci

01389286 MR 52##10094
Thresholds for deterministic epidemics.
Mathematical problems in biology (Conf., Univ. Victoria, Victoria, B.C., 1973)
Hoppensteadt, Frank
1974,
Springer, Berlin,; pp. 96--101. Lecture Notes in Biomath., Vol. 2,,
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: SHORT (8 lines)
The author considers a model for a deterministic epidemic and obtains an equation for the limiting number of exposed susceptibles, involving the number γ of susceptibles exposed to each infective. Not all assumptions are stated explicitly (e.g., the exponential life time for infectives), and the chart in fig. 1 does not seem to agree with the claim that the threshold value for γ is 1.
\{For the entire collection see MR 49\#10392.\}
Reviewer: Fischler, R.
Review Type: Signed review
Descriptors: *92A15 -Biology and other natural sciences, behavioral sciences-Population dynamics, epidemiology

1/5/292 (Item 82 from file: 239)
DIALOG(R)File 239:Mathsci

01385286 MR 52##6127
A geometric approach to boundary value problems for nonlinear ordinary differential equations with a small parameter.
Analytic theory of differential equations (Proc. Conf., Western Michigan

Univ., Kalamazoo, Mich., 1970)
Hoppensteadt, Frank C.
1971,
Springer, Berlin,; 35--41. Lecture Notes in Math., Vol. 183,,
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (14 lines)
The author considers singularly perturbed boundary value problems for the vector system $\varepsilon\,dy/dt=f(t,y,\varepsilon)$ when $f(t,0,0)=0$ and $f\sb y(t,0,0)$ is conditionally stable. Appropriate boundary value problems are shown to have the trivial limiting solution with endpoint boundary layers determined by separate initial value problems with data asymptotically restricted to lower dimensional manifolds. Significant extensions have been given by the author [Comm. Pure Appl. Math. 24 (1971), 807--840; MR 44\#5576] and by others. Related work appears in the book by A. B. Vasileva and V. F. Butuzov [Asymptotic expansions of the solutions of singularly perturbed equations (Russian), Izdat. ``Nauka'', Moscow, 1973].
\{For the entire collection see MR 51\#6002.\}
Reviewer: O'Malley, R. E., Jr.
Review Type: Signed review
Descriptors: *34E15 -Ordinary differential equations-Asymptotic theory-Singular perturbations, general theory

1/5/293 (Item 83 from file: 239)
DIALOG(R)File 239:Mathsci

01365083 MR 51##1312
Asymptotic behavior of solutions to a population equation.
Greenberg, J. M.
Hoppensteadt, F.
SIAM J. Appl. Math.
1975, 28, 662--674.
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (29 lines)
Consider the nonlinear integral equation (E) $x(t)=\alpha(t)+\gamma\int\sb {\max(-1,t-1)}\sp tx(1-x)(\eta)\,d\eta\ (\gamma>0,t\geq-1)$, with the condition $0\leq x(t)\leq 1$. For $t\geq 0$, (E) reduces to (E$\sb {\text+}$) $x(t)=\gamma\int\sb {t-1}\sp tx(1-x)(\eta)\,d\eta$. In order to estimate the rates at which the solution approaches equilibrium, consider moderate or large values of γ: (a) for $0<\gamma\leq 1$, $x=0$ is the stable equilibrium point of (E$\sb {\text+}$) and $0<x(t)<Y\sb n$, $n-1\leq t<n$, where $Y\sb 1=\gamma/4$ and $Y\sb n=\gamma Y\sb {n-1}(1-Y\sb {n-1})\ (n=2,3,\cdots)$, i.e., the convergence $x(\cdot)\rightarrow 0$ is majorized by the convergence to zero of iterates of the polynomial $\gamma x(1-x)$; (b) define w by $x(t)=(\gamma-1)/\gamma+w(t)$. For $\gamma>1$, the stable solution is $x=(\gamma-1)/\gamma$, i.e., the convergence $w(\cdot)\rightarrow 0$ is majorized by the convergence to zero of iterates of $w(2-\gamma-\gamma w)$. For $\gamma\gg 1$, the solution has a linear and an oscillatory part and depends on time scales other than t. A multitime perturbation expansion is derived.
Equation (E) describes the behavior of a deterministic epidemic, where $x(t)$ is the normalized number of infectives at time t and $\alpha(t)$ is the number of initial infectives remaining at time t (the function $\alpha(\cdot)$ is continuous on $[-1,0)$ and satisfies the condition $0<\alpha(t)<1$, $d\alpha/dt\leq 0$ for $-1\leq t<0$, and $\alpha\equiv 0$ for $t>0$). The existence and uniqueness of solutions of (E$\sb {\text+}$) have been proved by the second author and P. Waltman [Math. Biosci. 12 (1971), 133--145; MR 46\#1373].
Reviewer: Tautu, P.
Review Type: Signed review
Descriptors: *45M05 -Integral equations-Qualitative behavior-Asymptotics

; 92A15 -Biology and other natural sciences, behavioral sciences-Population dynamics, epidemiology

1/5/294 (Item 84 from file: 239)
DIALOG(R)File 239:Mathsci

01357947 MR 50##10389
Advances in differential and integral equations.
A collection of papers presented at the Conference on Qualitative Theory of Nonlinear Differential and Integral Equations held at the University of Wisconsin, Madison, Wis., August 12--23, 1968. In memoriam: Rudolph E. Langer (March 8, 1894 to March 11, 1968). Edited by John A. Nohel.
Contributors: Langer, Rudolph E.; Nohel, John A.; Grafton, R. B.; Kaniel, S.; Berger, M. S.; Newell, Alan C.; Brunovsky, P.; Winston, Elliot; **Hoppensteadt, Frank** ; Easton, R.; Heard, Melvin L.; Comstock, Craig; Hastings, S. P.; Cellina, Arrigo; Dettman, J. W.; Gustafson, G. B.; Fink, A. M.; Fusaro, B. A.; Schuur, J. D.; Yorke, James
Publ: Society for Industrial and Applied Mathematics, Philadelphia, Pa., 1969, xvi+207 pp.
Price: $8.65.
Language: English
Document Type: Book
Advances in differential and integral equations; Conference: Qualitative Theory of Nonlinear Differential and Integral Equations; Nonlinear differential equations; Nonlinear integral equations (Conf. Qualitative Theory of Nonlinear Differential and Integral Equations, Univ. Wisconsin, Madison, Wis., 1968) (Univ. Wisconsin, Madison, Wis., 1968)
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (122 lines)
From the editor's preface: ``This volume consists of invited lectures, together with abstracts of contributed papers, delivered at the conference. As indicated by the table of contents, the lectures divide naturally into five areas; some of the papers overlap several fields. The abstracts of contributed papers have been appended to the chapters in accordance with the topic. Several of the contributed papers are very closely related to particular longer papers discussed in the main part of the chapter. Two lectures were presented at the Conference in addition to the papers appearing here. Professor Jurgen Moser of the Courant Institute of Mathematical Sciences presented a new formulation of Sacker's result on continuation under perturbations of smooth invariant manifolds. Professor Stephen Smale, University of California at Berkeley, spoke on `Global stability questions', concerning diffeomorphisms of a smooth, compact manifold; he discussed necessary and sufficient conditions for structural as well as Ω-stability. His lecture will appear in the Proceedings of the 1968 AMS Summer Institute in Global Analysis.''
Table of Contents: John A. Nohel, Preface (pp. xi-xvi).
Chapter 1: Problems in partial differential equations: Invited lectures: D. G. Aronson, Local behavior of solutions of nonlinear parabolic equations (pp. 3--8); Avner Friedman, Nonlinear eigenvalue problems (pp. 9--13); Fritz John, Plane waves of finite amplitude (pp. 14--19); P. H. Rabinowitz, Existence of periodic solutions for some nonlinear hyperbolic partial differential equations (pp. 20--24); E. B. Fabes and N. M. Riviere, $L\sp p$-estimates $(1<p\leq\infty)$ near the boundary for solutions of the Dirichlet problem (pp. 25--34); James Serrin, Existence theorems for some compressible boundary layer problems (pp. 35--42).
Abstracts of contributed papers: J. W. Dettman, Related well-posed and ill-posed problems in partial differential equations (p. 45); B. A. Fusaro, The Cauchy-Kowalewski theorem and a singular initial value problem (pp. 46--47); S. P. Hastings, An existence proof for a boundary value problem arising in boundary layer theory (pp. 47--48); S. Kaniel, On the motion of a viscous incompressible fluid (p. 48); D. Mangeron and M. N. Oguztoreli, Boundary value and optimal problems concerned with various types of ``polyvibrating'' equations (pp. 48--49); Alan C. Newell, A note on the multiple time scale method in perturbation problems (p. 49); B. J. Matkowsky, Asymptotic solution of a nonlinear stability problem (pp.

49--51); D. Sattinger, Quantum scattering and asymptotic series (p. 51); R. E. Showalter and T. W. Ting, Pseudoparabolic partial differential equations (p. 51); Gabe Buis, Martin Eisen and W. G. Vogt, Lyapunov stability of partial differential equations (p. 52).

Chapter 2: Delay and integral equations: Invited lectures: C. Corduneanu, Admissibility with respect to an integral operator and applications (pp. 55--63); Stephen Grossberg, A global prediction (or learning) theory for some nonlinear functional-differential equations (pp. 64--70); Jack K. Hale, Behavior near a periodic orbit of functional differential equations (pp. 71--75); J. J. Levin, Boundedness and oscillation of some Volterra and delay equations (pp. 76--81); R. K. Miller, The topological dynamics of Volterra integral equations (pp. 82--87).

Abstracts of contributed papers: R. B. Grafton, A periodicity theorem for functional differential equations with applications (p. 91); Melvin L. Heard, On asymptotic behavior and periodic solutions of a certain Volterra integral equation (p. 92); A. P. Stokes, On the stability of integral manifolds for functional differential equations (pp. 92--93); Elliot Winston, Uniqueness of the zero solution for state dependent delay differential equations (pp. 93--94).

Chapter 3: Dynamical systems: Invited lectures: C. Conley and R. Easton, Isolated invariant sets and isolating blocks (pp. 97--104); S. P. Diliberto, Qualitative behavior for classical dynamical systems (pp. 105--113); Lawrence Markus, The misbehavior of the solutions of a differential system near a periodic solution (pp. 114--116); Robert J. Sacker and George R. Sell, The existence of periodic solutions on two-manifolds (pp. 117--118); George Seifert, Recurrence and almost periodicity in ordinary differential equations (pp. 119--121); Lawrence Markus and George R. Sell, Problems on capture and control in conservative dynamical systems (pp. 122--124); G. P. Szego, Extension theorems for flows without uniqueness (pp. 125--130).

Abstracts of contributed papers: Prem N. Bajaj, Singular points in products of semidynamical systems (pp. 133--134); Courtney Coleman, Local canonical forms for differential systems (pp. 134--137); R. Easton, A flow near a degenerate critical point (p. 137); Kenneth R. Meyer and Julian Palmore, Bridges in the restricted three-body problem (pp. 137--139).

Chapter 4: Behavior of periodic solutions: Invited lectures: Lamberto Cesari, Functional analysis and differential equations (pp. 143--155); D. C. Lewis, Some general methods for detecting the existence of periodic solutions (pp. 156--158); W. S. Loud, Branching of periodic solutions of second order equations (pp. 159--165); Taro Yoshizawa, Some remarks on the existence and the stability of almost periodic solutions (pp. 166--172).

Abstracts of contributed papers: M. S. Berger, On periodic solutions of Hamiltonian systems of ordinary differential equations (p. 175); P. Brunovsky, On stabilization of periodic solutions of nonlinear systems (p. 175); Craig Comstock, On the limit cycles of $\ddot y-\mu\sin\dot y+y=0$ (pp. 175--177); A. M. Fink, Almost periodic solutions with module containment (p. 177); D. A. Sanchez, A note on periodic solutions of Riccati-type equations (pp. 177--178).

Chapter 5: Further topics in ordinary differential equations: Invited lectures: H. A. Antosiewicz, Set-valued mappings and differential equations (pp. 181--183); W. A. Harris, Holomorphic solutions of nonlinear differential equations at singular points (pp. 184--187); Henry Hermes, Existence and properties of solutions of $\dot x\in R(t,x)^\ast$ (pp. 188--193); Aaron Strauss, Perturbing asymptotically stable differential equations (pp. 194--198).

Abstracts of contributed papers: Arrigo Cellina, Multivalued differential equations and ordinary differential equations (pp. 201--202); J. W. Bebernes and Russell Wilhelmsen, A technique for solving two-dimensional boundary value problems (pp. 202--203); G. B. Gustafson, Examples in the oscillation theory of higher order equations (p. 203); Frank Hoppensteadt, Asymptotic expansions for singularly perturbed systems (pp. 203--204); J. D. Schuur, Saddle point type behavior for nonautonomous second order almost linear systems of differential equations (pp. 204--205); James A. Yorke, Some extensions of Lyapunov's second method (pp. 206--207).

\{The papers of mathematical interest will be reviewed individually. The

reviews will be indexed both under the names of the authors and under the following title: Advances in differential and integral equations (Conf. Qualitative Theory of Nonlinear Differential and Integral Equations, Univ. Wisconsin, Madison, Wis., 1968).\}
Reviewer: Editors
Review Type: Abstract
Descriptors: *34-06 -Ordinary differential equations-Proceedings, conferences, collections, etc. ; 35-06 -Partial differential equations-Proceedings, conferences, collections, etc.; 45-06 -Integral equations-Proceedings, conferences, collections, etc.

1/5/295 (Item 85 from file: 239)
DIALOG(R)File 239:Mathsci

01338557 MR 49##3298
Justification of matched asymptotic expansion solutions for some singular perturbation problems.
Partial differential equations (Proc. Sympos. Pure Math., Vol. XXIII, Univ. California, Berkeley, Calif., 1971)
Hoppensteadt, Frank
1973,
Amer. Math. Soc., Providence, R.I.,; pp. 337--341.,
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: SHORT (10 lines)
The author gives a lucid and concise discussion of methods for constructing asymptotic expansions for solutions of initial value problems of the form $\varepsilon u'(t)=F(t,u,\varepsilon)$, $u(0)=u\sb 0(\varepsilon)$, where $0\leq t\leq T\leq\infty$, $u(t)$ belongs to a Banach space E,ε is a small positive parameter, and F is a mapping into E. References are given to problems for which these methods have been verified.
\{For more complete bibliographic information about the collection in which this article appears, including the table of contents, see MR 48\#6620.\}
Reviewer: Greenlee, W. M.
Review Type: Signed review
Descriptors: *35B25 -Partial differential equations-Qualitative properties of solutions-Singular perturbations ; 34G05 -Ordinary differential equations-Differential equations in abstract spaces (See also 58D25)-Differential equations in Banach and other abstract spaces (See also 47Bxx.)

1/5/296 (Item 86 from file: 239)
DIALOG(R)File 239:Mathsci

01338536 MR 49##3277
Asymptotic stability in singular perturbation problems. II. Problems having matched asymptotic expansion solutions.
Hoppensteadt, Frank
J. Differential Equations
1974, 15, 510--521.
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (24 lines)
As in Part I [same J. 4 (1968), 350--358; MR 37\#1730], the author considers the system (1) $dx/dt=f(t,x,y,\varepsilon)$, $\varepsilon\,dy/dt=g(t,x,y,\varepsilon)$ together with the reduced system (2) $dx/dt=f(t,x,y,0)$, $0=g(t,x,y,0)$ and assumes that (2) has a solution $(x\sb 0(t),y\sb 0(t))$ lying on a smooth branch of $g(t,x,y,0)=0$. He makes two stability assumptions: (i) The linear system $dz/dt=(f\sb x-f\sb

yg\sb y{}\sp {-1}g\sb x)(t,x\sb 0(t),y\sb 0(t),0)z$ is exponentially asymptotically stable; (ii) the real parts of the eigenvalues of $g\sb y(t,x\sb 0(t),y\sb 0(t),0)$ are uniformly bounded above by a negative number. He shows that if $\xi(\varepsilon)$ and $\eta(\varepsilon)$ are smooth functions of ε at $\varepsilon=0$, and $\xi(0)$ and $\eta(0)$ are in certain ``domains of attraction'' (independent of ε), then (1) has a unique solution satisfying $x(0)=\xi(\varepsilon)$, $y(0)=\eta(\varepsilon)$; and if $(x,y),(\tilde x,\tilde y)$ are two such solutions (belonging to (ξ,η) and $(\tilde\xi,\tilde\eta)$, respectively), then $(x(t,\varepsilon),y(t,\varepsilon))-(\tilde x(t,\varepsilon),\tilde y(t,\varepsilon))\rightarrow 0$ as $t\rightarrow\infty$. Under additional assumptions such solutions tend to finite limits as $t\rightarrow\infty$, and the author shows how the asymptotic expansions of these limits in powers of ε can be computed.

Reviewer: Erdelyi, A.

Review Type: Signed review

Descriptors: *34D15 -Ordinary differential equations-Stability theory (See also 58F10, 93Dxx)-Singular perturbations

1/5/297 (Item 87 from file: 239)

DIALOG(R)File 239:Mathsci

01302238 MR 46##1373

A problem in the theory of epidemics. II.

Hoppensteadt, Frank

Waltman, Paul

Math. Biosci.

1971, 12, 133--145.

Language: English

Document Type: Journal

Subfile: MR (Mathematical Reviews) AMS

Abstract Length: MEDIUM (11 lines)

The authors modify earlier work [Math. Biosci. 9 (1970), 71--91; MR 44\#7083] to obtain what they feel is an improved model of the spread of infection in an epidemic. In this new version an individual who is recovered from the infection is allowed to become reinfected. (By allowing for an infinitely long period before this reinfection is possible, they include the previous model.) Their scheme results in a set of five nonlinear integral equations, and they prove the basic results on existence, uniqueness and continuous dependence for these equations. They also discuss some numerical computations done on the model.

Reviewer: Hastings, S. P.

Review Type: Signed review

Descriptors: *92A15 -Biology and other natural sciences, behavioral sciences-Population dynamics, epidemiology

1/5/298 (Item 88 from file: 239)

DIALOG(R)File 239:Mathsci

01289912 MR 44##7083

A problem in the theory of epidemics.

Hoppensteadt, Frank

Waltman, Paul

Math. Biosci.

1970, 9, 71--91

Language: English

Document Type: Journal

Subfile: MR (Mathematical Reviews) AMS

Abstract Length: SHORT (9 lines)

The authors consider a model, proposed by K. Cooke [Differential equations and dynamical systems (Proc. Internat. Sympos., Mayaguez, P.R., 1965), pp. 167--183, Academic Press, New York, 1967; MR 36\#5461], for the

spread of an infection. The model leads to a functional differential equation where the delay depends on time, together with a coupled integral equation. The authors show existence, uniqueness, and continuous dependence on initial data. Then they discuss approximate solutions and numerical methods.

Reviewer: Hastings, S. P.

Descriptors: *34.75 -ORDINARY DIFFERENTIAL EQUATIONS-Functional differential equations: differential-difference ; 92.00 -BIOLOGY AND BEHAVIORAL SCIENCES-General

1/5/299 (Item 89 from file: 239)

DIALOG(R)File 239:Mathsci

01288394 MR 44##5576

Properties of solutions of ordinary differential equations with small parameters.

Hoppensteadt, Frank

Comm. Pure Appl. Math.

1971, 24, 807--840

Language: English

Document Type: Journal

Subfile: MR (Mathematical Reviews) AMS

Abstract Length: MEDIUM (22 lines)

Initial value problems of the form $dx/dt=f(t,x,y,\varepsilon)$, $\varepsilon\,dy/dt=g(t,x,y,\varepsilon)$, $x(0)=\xi(\varepsilon)$, $y(0)=\eta(\varepsilon)$, where x and y are vector functions, are solved asymptotically for small ε under assumptions more general than in the previous literature. As in the work of A. B. Vasileva [e.g., in Uspehi Mat. Nauk 18 (1963) no. 3 (111), 15--86; MR 28\#1363] and of others, the solution is represented as a sum of an ``outer'' and an ``inner'' solution. The main new features of this work appear to be the following: (1) Let $x\sb 0(t)$, $y\sb 0(t)$ be the solution of the ``reduced'' system obtained for $\varepsilon=0$, of which the solution to be found for $\varepsilon>0$ is a singular perturbation. The eigenvalues of the Jacobian matrix $\partial g(t,x\sb 0(t),y\sb 0(t))/\partial y$, which are crucial in the theory, are subjected to milder conditions than in previous work. Some of them may even cross the imaginary axis, as t changes. (2) The ``matching'' condition which determines the initial values at $t=0$ of the outer solution is put into a significantly simpler and more natural form.

Short descriptions are given of extensions of the theory to two-point boundary value problems and to systems with several parameters.

Reviewer: Wasow, W.

Descriptors: *34.54 -ORDINARY DIFFERENTIAL EQUATIONS-Singular perturbations; small parameter with highest

1/5/300 (Item 90 from file: 239)

DIALOG(R)File 239:Mathsci

01269986 MR 42##4863

On quasilinear parabolic equations with a small parameter.

Hoppensteadt, Frank

Comm. Pure Appl. Math.

1971, 24, 17--38

Language: English

Document Type: Journal

Subfile: MR (Mathematical Reviews) AMS

Abstract Length: MEDIUM (19 lines)

The main purpose of this paper is to derive an expansion for the solution of the quasilinear boundary value problem $$ \multline \varepsilon(\partial u/\partial t)-\sum\sb {i,j=1}\sp na\sb {ij}(x,t,u,\nabla u,\varepsilon)\,\partial\sp 2u/\partial x\sb i\partial x\sb j=\\ f(x,t,u,\nabla u,\varepsilon), \endmultline $$ $u(x,t,\varepsilon)=0$,

$x\in\partial\Omega$, $0\leq t\leq T$, $u(x,0,\varepsilon)=u\sb 0(x,\varepsilon)$, $x\in\Omega$, in the smooth domain $\Omega\subset E\sp n$ which is valid as $\varepsilon\downarrow 0$. While the methods used here are formally similar to those used in the author's previous paper [Arch. Rational Mech. Anal. 35 (1969), 284--298; MR 40\#1694], where semilinear problems were treated and the resulting expansion was valid only in the $L\sp P(\Omega)$ norms, the current methods allow use of uniform norms everywhere.

The author mentions that more general problems can be treated by variants of the present method, e.g., higher order parabolic equations with more general boundary conditions, systems of parabolic type, and parabolic equations coupled with integro-differential equations.

Reviewer: Sigillito, V. G.

Descriptors: *35.14 -PARTIAL DIFFERENTIAL EQUATIONS-Singular perturbations, almost periodic solutions

1/5/301 (Item 91 from file: 239)

DIALOG(R)File 239:Mathsci

01249863 MR 40##3088

Cauchy problems involving a small parameter.

Hoppensteadt, Frank

Bull. Amer. Math. Soc.

1970, 76, 142--146

Language: English

Document Type: Journal

Subfile: MR (Mathematical Reviews) AMS

Abstract Length: MEDIUM (19 lines)

For the initial value problem $\varepsilon(dv/dt)-A(t,\varepsilon)v=f(t,v,\varepsilon)$, $0\leq t\leq T$, $v(0)=v\sp 0(\varepsilon)$, where v is an element of a Banach space E and $\varepsilon>0$ is a small parameter, a method is given for finding an expansion for the solution which is valid as $\varepsilon\rightarrow 0$. The expansion has the form $\sum\sb {r=0}\sp \infty[v\sb r(t)+V\sb r(t/\varepsilon)-U\sb r(t/\varepsilon)]\varepsilon\sp r$, where the $v\sb r$ give the solution for t away from zero, the $V\sb r$ give it for t near zero, and the $U\sb r$ are matching terms to make the representation valid uniformly in $0\leq t\leq T$. Three cases are treated: (i) Abstract parabolic case where, for each $(t,\varepsilon)\in[0,T]\times[0,\varepsilon\sb 0]$, $-A(t,\varepsilon)$ is the infinitesimal generator of an analytic semigroup of operators in E. (ii) Abstract hyperbolic case where, for each (t,ε), $-A(t,\varepsilon)$ is the infinitesimal generator of a semigroup of class $C\sb 0$. (iii) Parabolic case where A is a positive definite elliptic operator in $E=L\sp \infty$.

Reviewer: Hersh, R.

Descriptors: *35.95 -PARTIAL DIFFERENTIAL EQUATIONS-Operator equations, general (See also 34.95)

1/5/302 (Item 92 from file: 239)

DIALOG(R)File 239:Mathsci

01248458 MR 40##1694

Asymptotic series solutions of some nonlinear parabolic equations with a small parameter.

Hoppensteadt, Frank

Arch. Rational Mech. Anal.

1969, 35, 284--298

Language: English

Document Type: Journal

Subfile: MR (Mathematical Reviews) AMS

Abstract Length: LONG (26 lines)

Si considera il problema (1)

$\varepsilon\,dv/dt+A(t,\varepsilon)v=f(t,v,\varepsilon)$, $v(t\sb 0)=\overset 0\to v$, $v\in E$, ove E e uno spazio di Banach, ε e un parametro positivo, $A(t,\varepsilon)$ sono operatori lineari, chiusi, anche illimitati, con dominio di definizione $D=D(A(t,\varepsilon))$ denso in E e indipendente da t e da ε per $0\leq t\leq T$, $0\leq\varepsilon\leq\varepsilon\sb 0$; $f(t,v,\varepsilon)=\sum\sb {i,j,k=0}\sp \infty\varepsilon\sp it\sp jf\sb {ijk}v\sp k$ e $f\sb {ijk}$ sono operatori k-lineari, limitati in E. Si suppone il problema (1) di tipo parabolico (si ammette cioe che per ogni (t,ε), $-A(t,\varepsilon)$ sia generatore di un semigruppo analitico di operatori limitati in E). Al fine di pervenire a uno sviluppo asintotico della soluzione del problema considerato, l'autore studia dapprima la soluzione fondamentale relativa alla parte lineare di (1), dandone una valutazione per $\varepsilon\rightarrow 0$. Successivamente dimostra, sotto opportune ipotesi per gli operatori A e le funzioni f e v, che il problema (1) ammette, per ogni ε sufficientemente piccolo, una sola soluzione $v(t,\varepsilon)$ continua e differenziabile per $0\leq t\leq T$ e assegna, per tale soluzione, supposto $\overset 0\to v\in D$, uno sviluppo asintotico valido per $\varepsilon\rightarrow 0$. Il metodo usato puo essere esteso per trattare problemi con condizioni iniziali piu generali di quelle considerate in (1).

Reviewer: Vaghi, C.

Descriptors: *35.14 -PARTIAL DIFFERENTIAL EQUATIONS-Singular perturbations, almost periodic solutions

1/5/303 (Item 93 from file: 239)

DIALOG(R)File 239:Mathsci

01239232 MR 39##573

On systems of ordinary differential equations with several parameters multiplying the derivatives.

Hoppensteadt, Frank

J. Differential Equations
1969; 5, 106--116
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: LONG (29 lines)

The initial value problem $x'=f(t,x,y\sb 1,\cdots,y\sb n,\varepsilon),x(t\sb 0)=x\sb 0,\varepsilon\sb jy\sb j{}'=g\sb j(t,x,y\sb 1,\cdots,y\sb n,\varepsilon),y\sb j(t\sb 0)=y\sb {j0}\,(j=1,\cdots,n)$ is studied asymptotically, as the n positive parameters $\varepsilon\sb j$ tend to zero in such a way that $\varepsilon\sb {j+1}/\varepsilon\sb j\rightarrow 0$ for $j=1,\cdots,n$. Here, $x,y\sb 1,\cdots,y\sb n$ and $f,g\sb 1,\cdots,g\sb n$ are real vectors of dimensions $k,k\sb 1,\cdots,k\sb n$, respectively, while ε is the vector $(\varepsilon\sb 1,\varepsilon\sb 2,\cdots,\varepsilon\sb n)$. A set of sufficient conditions is given under which the solution of the initial value problem tends, uniformly in unbounded t-intervals, to the solution of the reduced problem obtained formally by setting $\varepsilon=0$ and canceling the initial conditions on the $y\sb j$. The conditions involve the uniform smoothness of the coefficients on the infinite t-interval and the existence and stability of the solutions of certain auxiliary differential equations that may appropriately be called ``boundary layer'' equations. The special case $n=1$ was the subject of the author's paper in Trans. Amer. Math. Soc. 123 (1966), 521--535 [MR 33\#2900]. The method of proof is similar to that of the earlier paper and involves the construction of Ljapunov functions for the boundary layer equations, but there are non-trivial differences, caused by the occurrence of a hierarchy of n boundary layer equations. The author's counterexamples in this as well as the earlier paper indicate that his hypotheses cannot be substantially weakened if uniform convergence on unbounded t-intervals is desired.

Reviewer: Wasow, W.

Descriptors: *34.54 -ORDINARY DIFFERENTIAL EQUATIONS-Singular perturbations; small parameter with highest

1/5/304 (Item 94 from file: 239)
DIALOG(R)File 239:Mathsci

01237917 MR 38##6178
Asymptotic series solutions for nonlinear ordinary differential equations with a small parameter.
Hoppensteadt, Frank
J. Math. Anal. Appl.
1969, 25, 521--536
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: SHORT (5 lines)
In the author's previous work on singular perturbations [Trans. Amer. Math. Soc. 123 (1966), 521--535; MR 33\#2900], he studied the dependence of solutions on a parameter for the infinite interval. Here he obtains an asymptotic expansion in powers of the parameter.
Reviewer: Brauer, F.
Descriptors: *34.54 -ORDINARY DIFFERENTIAL EQUATIONS-Singular perturbations; small parameter with highest

1/5/305 (Item 95 from file: 239)
DIALOG(R)File 239:Mathsci

01226156 MR 37##1730
Asymptotic stability in singular perturbation problems.
Hoppensteadt, Frank
J. Differential Equations
1968, 4, 350--358
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (21 lines)
The paper deals with real systems (1) $x'=f(t,x,y,\varepsilon)$, $\varepsilon y'=g(t,x,y,\varepsilon)$, $x(t\sb 0)=x\sb 0$, $y(t\sb 0)=y\sb 0$, where x and y are, respectively, n- and m-dimensional vectors, and ε is a small positive parameter. For the sake of simplicity it is assumed that $f(t,0,0,0)=g(t,x,0,0)=0$. Two degenerate systems associated with (1) are (2) $x'=f(t,x,0,0)$, $x(t\sb 0)=x\sb 0$, and (3) $dy/ds=g(\alpha,\beta,y,0)$, $y(0)=y\sb 0$ (α and β are parameters). Appropriate differentiability and boundedness conditions are imposed on f and g and it is assumed that the solutions $x=0$ and $y=0$ of (2) and (3) are uniform-asymptotically stable, the latter uniformly in α,β. Theorem 1: Under the further assumption that f and g are periodic functions of t (with a common period), for each sufficiently small positive ε there exists a uniformly asymptotically stable tube of solutions of (1). Theorem 2: Under certain further assumptions, including the assumption that f and g are independent of ε, the solution $x=y=0$ for (1) is asymptotically stable (Ljapunov) for each sufficiently small positive ε.
Reviewer: Erdelyi, A.
Descriptors: *34.54 -ORDINARY DIFFERENTIAL EQUATIONS-Singular perturbations; small parameter with highest

1/5/306 (Item 96 from file: 239)
DIALOG(R)File 239:Mathsci

01204796 MR 34##4618
Stability in systems with parameter.
Hoppensteadt, Frank

J. Math. Anal. Appl.
1967, 18, 129--134
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (14 lines)

The author considers a system of differential equations $x'=f(x,a)$ depending on a (vector) parameter a. He defines uniform stability and uniform asymptotic stability with respect to a. If $f(0,a)=0$ for each a, so that $x=0$ is a solution for each a, then asymptotic stability of this solution for each a implies uniform stability with respect to a. In his study of singular perturbation problems, A. N. Tihonov [Mat. Sb. (N.S.) 31 (73) (1952), 575--586; MR 14, 1085] uses a result of this type, but concluding uniform asymptotic stability in a. The author shows by an example that this result is false, but indicates how Tihonov's proof can be corrected. He also gives a generalization of the result on uniform stability with respect to a to non-autonomous systems.

Reviewer: Brauer, F.
Descriptors: *34.51 -ORDINARY DIFFERENTIAL EQUATIONS-Stability

1/5/307 (Item 97 from file: 239)
DIALOG(R)File 239:Mathsci

01194709 MR 33##2900
Singular perturbations on the infinite interval.
Hoppensteadt, Frank Charles
Trans. Amer. Math. Soc.
1966, 123, 521--535
Language: English
Document Type: Journal
Subfile: MR (Mathematical Reviews) AMS
Abstract Length: MEDIUM (23 lines)

The purpose of the paper is to study the behavior, as $\varepsilon\rightarrow 0^+$, of the solutions of the initial value problem $x'=f(t,x,y,\varepsilon)$, $x(t_0)=x_0$; $\varepsilon y'=g(t,x,y,\varepsilon)$, $y(t_0)=y_0$, for $t_0\leq t<\infty$. Here, f and g are real vectors of dimensions k and j, respectively. Conditions are given under which the solution converges uniformly, as $\varepsilon\rightarrow 0^+$, not only on compact sets, but also on infinite intervals $t_0<t_1\leq t<\infty$. These conditions resemble in character those given by Tihonov [Mat. Sb. (N.S.) 31 (73) (1952), 575--586; MR 14, 1085], but include more stringent uniformity and boundedness requirements for infinite intervals. The author shows by a series of examples that uniform convergence need not take place if any of his conditions is omitted. One of these examples deserves particular mention, because it disproves a claim by Butuzov [Vestnik Moscov. Univ. Ser. I Mat. Meh. 1963, no. 4, 3--14; MR 27\#3893] concerning the uniform convergence on infinite intervals of linear singular perturbation problems. The proof of the author's convergence theorem combines the use of Ljapunov functions, constructed with the help of a lemma of Massera [Ann. of Math. (2) 50 (1949), 705--721; MR 11, 721], with arguments similar to those of Tihonov.

Reviewer: Wasow, W.
Descriptors: *34.50 -ORDINARY DIFFERENTIAL EQUATIONS-Asymptotic expansions, asymptotic behavior of solutions,

1/5/308 (Item 1 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

09451356 Genuine Article#: U4462 Number of References: 28
Title: INTERMITTENT CHAOS, SELF-ORGANIZATION, AND LEARNING FROM SYNCHRONOUS SYNAPTIC ACTIVITY IN MODEL NEURON NETWORKS
Author(s): **HOPPENSTEADT FC**

Corporate Source: MICHIGAN STATE UNIV,DEPT MATH/E LANSING//MI/48823
Journal: PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA, 1989, V86, N9, P2991-2995
Language: ENGLISH   Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC LIFE--Current Contents, Life Sciences
Journal Subject Category: MULTIDISCIPLINARY SCIENCES
Research Fronts: 87-0158 002   (NEURAL NETWORKS; ASSOCIATIVE MEMORY; VERSATILE ADAPTIVE LEARNING CAPABILITIES)
87-1341 001   (GUINEA-PIG VENTRICULAR MYOCYTES; INTRACELLULAR SODIUM ACTIVITY IN SHEEP CARDIAC PURKINJE-FIBERS; NA-CA EXCHANGE MECHANISM; ANTIARRHYTHMIC AGENT)
87-1743 001   (FUNCTIONAL PROGRAMMING STYLE; REDUCTION SYSTEMS; CATEGORICAL ABSTRACT MACHINE; INFINITE NETWORKS)
87-2878 001   (PULSE RESPONSE OF NON-LINEAR NON-STATIONARY VIBRATIONAL SYSTEMS; CHAOTIC BEHAVIOR; GLOBAL BIFURCATIONS; POL OSCILLATOR; VANDERPOL EQUATION)
Cited References:

ARNOLD VI, 1983, GEOMETRICAL METHODS
BOGOLIUBOFF NN, 1961, ASYMPTOTIC METHODS T
DENJOY A, 1932, V11, P333, J MATH PURES APPL
FITZHUGH R, 1969, P1, BIOL ENG
FLAHERTY JE, 1978, V58, P5, STUD APPL MATH
GREENBERG JM, 1978, V84, P1296, B AM MATH SOC
GUTMANN R, 1980, V56, P9, J MEMBRANE BIOL
HARMON LD, 1961, V1, P89, KYBERNETIK
HODGKIN AL, 1952, V117, P500, J PHYSIOL
HOLDEN AV, 1976, V21, P1, BIOL CYBERN
HOPFIELD JJ, 1982, V79, P2554, P NATIONAL ACADEMY S
HOPPENSTEAD FC, 1977, V56, P273, STUD APPL MATH
HOPPENSTEADT FC, 1986, INTRO MATH NEURONS
HOPPENSTEADT FC, 1977, V58, P73, SIAM J APPL MATH
HOROWITZ P, 1980, ART ELECTRONICS
KLEENE SC, 1952, INTRO METAMATHEMATIC
KNIGHT BW, 1972, V59, P734, J GENERAL PHYSIOLOGY
MALKIN IG, 1952, AECTR3352 US AT EN C
MASSERA JL, 1956, V64, P182, ANN MATH
MCCULLOCH WS, 1943, V5, P115, B MATH BIOPHYS
MOE GK, 1964, V67, P200, AM HEART J
PERKEL DH, 1964, V163, P61, SCIENCE
RALL W, 1976, V1, P39, HDB PHYSL
TURING AM, 1936, V5, P230, P LOND MATH SOC
VANDERPOL B, 1928, V6, P763, PHIL MAG 7
VONNEUMANN J, 1958, COMPUTER BRAIN
WIENER N, 1946, V16, P205, ARCH I CARDIOL MEXIC
WIENER N, 1961, P191, CYBERNETICS+

1/5/309   (Item 2 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

08415377   Genuine Article#: K6109   Number of References: 12
Title: FREQUENCY-MODULATION DYNAMICS IN NEURAL NETWORKS
Author(s): **HOPPENSTEADT FC**
Corporate Source: MICHIGAN STATE UNIV,DEPT MATH/E LANSING//MI/48824
Journal: ANNALS OF THE NEW YORK ACADEMY OF SCIENCES, 1987, V504, JUL, P 52-61
Language: ENGLISH   Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch
Journal Subject Category: MULTIDISCIPLINARY SCIENCES
Research Fronts: 86-3927 001   (AUTO-CORRELATION SYSTEMS; IMPLEMENTATION OF AN EFFICIENT FAST FOURIER-TRANSFORM ALGORITHM (EFFT); AIR-FLOW DATA)
Cited References:

BRAMBLE DM, 1983, V219, P251, SCIENCE
CARILLO H, 1983, THESIS UNAM

FLAHERTY JE, 1978, V58, P5, STUD APPL MATH
GRASMAN J, 1984, V46, P407, B MATH BIOL
GUTTMAN R, 1980, V56, P9, J MEMBRANE BIOL
HOPPENSTEADT FC, 1984, V1, P135, IMA J MATH APPL MED
HOPPENSTEADT FC, IN PRESS NONLINEAR O
HOPPENSTEADT FC, 1986, INTRO MATH NEURONS
HOROWITZ P, 1980, ART ELECTRONICS
MALKIN IG, 1951, THEORY STABILITY MOT
MASSERA JL, 1956, V64, P182, ANN MATH
VONEULER C, 1980, P275, TRENDS NEUROSCI

1/5/310 (Item 3 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

08246538 Genuine Article#: J4429 Number of References: 4
Title: A MATHEMATICAL-ANALYSIS OF SMALL MAMMAL POPULATIONS
Author(s): **HOPPENSTEADT FC** ; MURPHY L
Corporate Source: MICHIGAN STATE UNIV,DEPT MATH/E LANSING//MI/48824; OREGON STATE UNIV,DEPT MATH/CORVALLIS//OR/97331
Journal: JOURNAL OF MATHEMATICAL BIOLOGY, 1987, V25, N3, P263-274
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC LIFE--Current Contents, Life Sciences
Journal Subject Category: BIOLOGY, MISCELLANEOUS; MATHEMATICS, MISCELLANEOUS
Cited References:
FINERTY JP, 1976, POPULATION ECOLOGY C
HOPPENSTEADT FC, 1982, MATH METHODS POPULAT
NEGUS N, COMMUNICATION
NEGUS NC, 1977, V58, P347, J MAMMAL

1/5/311 (Item 4 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

06185211 Genuine Article#: TX625 Number of References: 5
Title: STABLE OSCILLATIONS OF WEAKLY NONLINEAR VOLTERRA INTEGRO-DIFFERENTIAL EQUATIONS
Author(s): **HOPPENSTEADT FC** ; SCHIAFFINO A
Corporate Source: UNIV UTAH,DEPT MATH/SALT LAKE CITY//UT/84112
Journal: JOURNAL FUR DIE REINE UND ANGEWANDTE MATHEMATIK, 1984, V353, P1-13
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS
Cited References:
ARNOLD VI, 1983, GEOMETRIC METHODS TH
CODDINGTON EA, 1955, THEORY ORDINARY DIFF
HALE JK, 1969, ORDINARY DIFFERENTIA
HOPPENSTEADT FC, 1983, V1017, P256, LECT NOTES MATH
MOSER J, 1970, V23, P609, COMM PURE APPL MATH

1/5/312 (Item 5 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

05671204 Genuine Article#: SH385 Number of References: 15
Title: SOME INFLUENCES OF POPULATION BIOLOGY ON MATHEMATICS
Author(s): **HOPPENSTEADT FC**
Journal: MEMOIRS OF THE AMERICAN MATHEMATICAL SOCIETY, 1984, V48, N298, P 25-29
Language: ENGLISH Document Type: ARTICLE

Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS
Research Fronts: 84-6141 001 (EVOLUTIONARY SIGNIFICANCE OF SEXUAL REPRODUCTION AND EVOLUTION OF SEX IN PLANTS AND ANIMALS)
Cited References:

BAILEY NTJ, 1956, MATH THEORY EPIDEMIC
FELLER W, 1968, INTRO PROBABILITY TH
FISHER RA, 1958, GENETICAL THEORY NAT
HOPPENSTEADT FC, 1981, CAMBRIDGE STUDIES MA
HOPPENSTEADT FC, 1978, MATH TODAY
KERMACK WO, 1937, V37, P172, J HYG
KERMACK WO, 1939, V39, P271, J HYG
KERMACK WO, 1932, V138, P55, P ROY SOC A
KERMACK WO, 1933, V161, P94, P ROY SOC A
KERMACK WO, 1927, V115, P700, P ROY SOC LOND A MAT
MKENDRICK AG, 1926, V44, P97, EDIN MATH SOC P
MKENDRICK AG, 1943, V50, P500, EDINBURGH MED J
MKENDRICK AG, 1914, V23, P401, P LONDON MATH SOC
RUBINOW SI, 1973, V10, MATH PROBLEMS BIOL S
VONFOERSTER H, 1959, P382, KINETICS CELLULAR PR

1/5/313 (Item 6 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

05532049 Genuine Article#: RX294 Number of References: 7
Title: AN EXTRAPOLATION METHOD FOR THE NUMERICAL-SOLUTION OF SINGULAR PERTURBATION PROBLEMS
Author(s): **HOPPENSTEADT FC** ; MIRANKER WL
Corporate Source: UNIV UTAH,DEPT MATH/SALT LAKE CITY//UT/84112; IBM CORP,THOMAS J WATSON RES CTR/YORKTOWN HTS//NY/10598
Journal: SIAM JOURNAL ON SCIENTIFIC AND STATISTICAL COMPUTING, 1983, V4, N4, P612-625
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS, APPLIED
Research Fronts: 84-4005 001 (OPTIMAL-CONTROL OF SINGULARLY-PERTURBED SYSTEMS AND HIERARCHICAL DECENTRALIZED CONTROL)
84-6487 001 (NUMERICAL METHODS OF ANALYSIS AND SIMULATION OF TIME-DEPENDENT CHEMICAL-REACTIONS AND OTHER DYNAMIC SYSTEMS)
Cited References:

HINDMARSH AC, 1974, UCID30001 LAWR LIV L
HOPPENSTEADT F, 1971, V24, P807, COMM PURE APPL MATH
HOPPENSTEADT F, 1979, REMARKS METHOD AVERA
HOPPENSTEADT FC, 1976, V22, P237, J DIFFERENTIAL EQUAT
LEVEQUE W, 1977, TOPICS NUMBER THEORY
MIRANKER WL, V5, LECTURE NOTES UER MA
PERSEK SC, 1978, V31, P133, COMM PURE APPL MATH

1/5/314 (Item 7 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

05480667 Genuine Article#: RT701 Number of References: 10
Title: AN AVERAGING METHOD FOR VOLTERRA INTEGRAL-EQUATIONS WITH APPLICATIONS TO PHASE-LOCKED FEEDBACK-SYSTEMS
Author(s): **HOPPENSTEADT FC**
Corporate Source: UNIV UTAH,DEPT MATH/SALT LAKE CITY//UT/84112
Journal: LECTURE NOTES IN MATHEMATICS, 1983, V1017, P256-265
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Research Fronts: 83-1344 001 (TITCHMARSH-WEYL-THEORY AND OTHER APPROACHES

TO BOUNDARY PROBLEMS FOR 2ND-ORDER DIFFERENTIAL-EQUATIONS WITH APPLICATION TO CHEMICAL-SYSTEMS)
83-2350 001 (STUDY OF CHEMICAL-WAVES FROM BROMATE OSCILLATORS, BELOUSOV-ZHABOTINSKII AND OTHER OSCILLATING REACTIONS)

Cited References:

ARNOLD VI, 1978, CHAIPTRES SUPPLEMENT
CODDINGTON EA, 1955, THEORY ORDINARY DIFF
HALE J, 1976, THEORY FUNCTIONAL DI
HOPPENSTEADT FC, SIAM J APPL MATH
HOPPENSTEADT FC, UNPUB SINGULAR PERTU
HOPPENSTEADT FC, 1982, V15, P339, J MATH BIOL
KEENER JP, CARDIAC ARRYTHMIAS A
LINSEY WC, 1972, SYNCHRONIZATION SYST
ROWSESMITT C, 1982, V60, P2798, CANAD J ZOO
WINFREE AT, 1980, GEOMETRY BIOL TIME

1/5/315 (Item 8 from file: 434)

DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

05305549 Genuine Article#: RE338 Number of References: 11

Title: AN ALGORITHM FOR APPROXIMATE SOLUTIONS TO WEAKLY FILTERED SYNCHRONOUS CONTROL-SYSTEMS AND NON-LINEAR RENEWAL PROCESSES

Author(s): **HOPPENSTEADT FC**

Corporate Source: UNIV UTAH,DEPT MATH/SALT LAKE CITY//UT/84112

Journal: SIAM JOURNAL ON APPLIED MATHEMATICS, 1983, V43, N4, P834-843

Language: ENGLISH Document Type: ARTICLE

Geographic Location: USA

Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences

Journal Subject Category: MATHEMATICS, APPLIED

Research Fronts: 83-1344 001 (TITCHMARSH-WEYL-THEORY AND OTHER APPROACHES TO BOUNDARY PROBLEMS FOR 2ND-ORDER DIFFERENTIAL-EQUATIONS WITH APPLICATION TO CHEMICAL-SYSTEMS)
83-1795 001 (EVOLUTION AND STABILITY OF SOLUTIONS TO NON-LINEAR FUNCTIONAL DIFFERENTIAL-EQUATIONS)
83-3511 001 (THEORY, ANALYSIS AND METHOD OF SOLUTION FOR NON-LINEAR SYSTEMS)
83-9335 001 (USE OF NON-LINEAR INTEGRAL-EQUATIONS IN PROBLEMS OF NUCLEAR PROCESS ANALYSIS)

Cited References:

CHARLESWORTH B, 1980, V1, CAMBRIDGE STUDIES MA
CODDINGTON EA, 1955, THEORY ORDINARY DIFF
HOPPENSTEADT F, 1971, V24, P807, COMM PURE APPL MATH
HOPPENSTEADT FC, 1976, V10, AMS SIAM P C APPLIED
HOPPENSTEADT FC, 1969, V35, P284, ARCH RAT MECH ANAL
HOPPENSTEADT FC, 1982, MATH METHODS POPULAT
KELLER JB, 1968, PERTURBATION THEORY
LINDSAY WC, 1972, SYNCHRONOUS SYSTEMS
MILLER RK, 1971, NONLINEAR VOLTERRA I
VOLTERRA V, 1959, THEORY FUNCTIONALS I
YOSIDA K, 1960, LECTURES DIFFERENTIA

1/5/316 (Item 9 from file: 434)

DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

04846155 Genuine Article#: PT845 Number of References: 18

Title: PHASE LOCKING OF BIOLOGICAL CLOCKS

Author(s): **HOPPENSTEADT FC** ; KEENER JP

Corporate Source: UNIV UTAH,DEPT MATH/SALT LAKE CITY//UT/84112

Journal: JOURNAL OF MATHEMATICAL BIOLOGY, 1982, V15, N3, P339-349

Language: ENGLISH Document Type: ARTICLE

Geographic Location: USA

Subfile: SciSearch; CC LIFE--Current Contents, Life Sciences

Journal Subject Category: BIOLOGY, MISCELLANEOUS; MATHEMATICS, MISCELLANEOUS
Cited References:

ARNOLD VI, 1965, V46, P213, AMS TRANSLATIONS
ARNOLD VI, 1961, V25, P21, IZV AKAD NAUK SSSR M
CODDINGTON EA, 1955, THEORY ORDINARY DIFF
EDMUNDS LN, 1981, V211, P1002, SCIENCE
FITZHUGH R, 1969, CH1 BIOL ENG
GUEVARA MR, 1982, V14, P1, J MATH BIOL
GUTTMAN R, FREQUENCY ENTRAINMEN
HALE JK, 1969, ORDINARY DIFFERENTIA
HERMAN TB, 1977, V29, P434, OIKOS
HOFFMANN K, 1971, P134, BIOCHRONOMETRY
HOPPENSTEADT FC, 1981, V19, AM MATH SOC LECTS AP
KEENER JP, 1981, V41, P503, SIAM J APPL MATH
KEENER JP, 1982, UNPUB ANAL PHASE LOC
MOSER J, 1966, V8, P145, SIAM REVIEW
ROWSEMITT CN, 1982, CANAD J ZOO
STEFAN P, 1977, V54, P237, COMMUN MATH PHYS
WINFREE AT, 1980, GEOMETRY BIOL TIME
WINFREE AT, 1981, V211, P265, MATH ASPECTS PHYSL

1/5/317 (Item 10 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

04835847 Genuine Article#: PT159 Number of References: 22
Title: PHOTOPERIODIC INDUCTION OF DIURNAL LOCOMOTOR-ACTIVITY IN MICROTUS-MONTANUS, THE MONTANE VOLE
Author(s): ROWSEMITT CN; PETTERBORG LJ; CLAYPOOL LE; **HOPPENSTEADT FC** ; NEGUS NC; BERGER PJ
Corporate Source: UNIV UTAH,DEPT BIOL/SALT LAKE CITY//UT/84112; UNIV UTAH,DEPT MATH/SALT LAKE CITY//UT/84112
Journal: CANADIAN JOURNAL OF ZOOLOGY-JOURNAL CANADIEN DE ZOOLOGIE, 1982, V 60, N11, P2798-2803
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC LIFE--Current Contents, Life Sciences; CC AGRI--Current Contents, Agriculture, Biology & Environmental Sciences
Journal Subject Category: ZOOLOGY
Cited References:

BAUMGARDNER DJ, 1980, V8, P322, ANIM LEARN BEHAV
BEHNEY WH, 1936, V17, P225, J MAMMAL
DAAN S, 1978, V127, P215, J COMP PHYSL
DAVIS DHS, 1933, V2, P232, J ANIMAL ECOL
ERKINARO E, 1969, V8, P1, AQUILO Z
ERKINARO E, 1961, V12, P157, OIKOS
GRODZINSKI W, 1962, P134, S THERIOLOGICUM CZEC
HAMMING RW, 1973, NUMERICAL METHODS SC
HANSEN RM, 1957, V38, P218, J MAMMAL
HATFIELD DM, 1940, V21, P29, J MAMMAL
HERMAN TB, 1977, V29, P434, OIKOS
HOFFMANN K, 1971, P134, BIOCHRONOMETRY
HOFFMANN K, 1969, V33, P171, ZOOL ANZ S
HOLLANDER M, 1973, NONPARAMETRIC STATIS
LEHMANN U, 1976, V23, P185, OECOLOGIA
OSTERMANN K, 1956, V66, P355, ZOOL JB PHYSIOL
PITTENDRIGH CS, 1960, V25, P259, COLD SPRING HARB SYM
PITTENDRIGH CS, 1967, P122, LIFE SCI SPACE RES
ROWSEMITT CN, 1981, THESIS U UTAH SALT L
STEBBINS LL, 1972, V25, P216, ARCTIC
STEBBINS LL, 1974, V25, P108, OIKOS
STEBBINS LL, 1975, V26, P32, OIKOS

1/5/318 (Item 11 from file: 434)

DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

04225190 Genuine Article#: MT915 Number of References: 13
Title: INTEGRATE-AND-FIRE MODELS OF NERVE MEMBRANE RESPONSE TO OSCILLATORY INPUT
Author(s): KEENER JP; **HOPPENSTEADT FC** ; RINZEL J
Corporate Source: UNIV UTAH,DEPT MATH/SALT LAKE CITY//UT/84112; NIAMDD,MATH RES BRANCH/BETHESDA//MD/20014
Journal: SIAM JOURNAL ON APPLIED MATHEMATICS, 1981, V41, N3, P503-517
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS, APPLIED
Cited References:

ASCOLI C, 1977, V19, P219, BIOPHYS J
CODDINGTON E, 1955, THEORY ORDINARY DIFF
FLAHERTY JE, 1978, V58, P5, STUD APPL MATH
GLASS L, 1979, V7, P339, J MATH BIOL
HERMAN MR, 1977, V597, P271, LECTURE NOTES MATH
HOLDEN AV, 1976, V21, P1, BIOL CYBERN
KEENER JP, 1980, V26, P589, T AMS
KNIGHT BW, 1972, V59, P734, J GEN PHYSIOL
MATTHEWS PBC, 1969, V200, P723, J PHYSIOL-LONDON
NEMOTO I, 1975, V15, P469, BIOPHYS J
PERKEL DH, 1964, V145, P61, SCIENCE
REID JVO, 1969, V78, P58, AM HEART J
RESCIGNO A, 1972, V32, P337, B MATH BIOPHYSICS

1/5/319 (Item 12 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

03738774 Genuine Article#: LB663 Number of References: 4
Title: THRESHOLD ANALYSIS OF A DRUG-USE EPIDEMIC MODEL
Author(s): **HOPPENSTEADT FC** ; MURRAY JD
Corporate Source: UNIV UTAH,DEPT MATH/SALT LAKE CITY//UT/84112; UNIV OXFORD,INST MATH/OXFORD OX1 3LB//ENGLAND/
Journal: MATHEMATICAL BIOSCIENCES, 1981, V53, N1-2, P79-87
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA; ENGLAND
Subfile: SciSearch; CC LIFE--Current Contents, Life Sciences
Journal Subject Category: BIOLOGY, MISCELLANEOUS; MATHEMATICS, MISCELLANEOUS
Cited References:

HOPPENSTEADT FC, 1975, MATH THEORIES POPULA
KERMACK WO, 1932, V138, P55, P ROY SOC A
KERMACK WO, 1927, V115, P700, P ROY SOC LOND A MAT
KERMACK WO, 1933, V141, P94, P ROY SOC LOND A MAT

1/5/320 (Item 13 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

03563079 Genuine Article#: KM590 Number of References: 0
Title: PATTERN FORMATION BY BACTERIA
Author(s): **HOPPENSTEADT FC** ; JAGER W
Corporate Source: UNIV UTAH/SALT LAKE CITY//UT/84112; UNIV HEIDELBERG/D-6900 HEIDELBERG 1//FED REP GER/
Journal: ADVANCES IN APPLIED PROBABILITY, 1980, V12, N3, P550
Language: ENGLISH Document Type: MEETING ABSTRACT
Geographic Location: USA; FEDERAL REPUBLIC OF GERMANY
Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences

Journal Subject Category: STATISTICS & PROBABILITY

1/5/321 (Item 14 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

02710447 Genuine Article#: HD293 Number of References: 3
Title: NON-UNIQUE STABLE RESPONSES OF EXTERNALLY FORCED OSCILLATORY SYSTEMS
Author(s): **HOPPENSTEADT FC** ; FLAHERTY JE
Corporate Source: UNIV UTAH,DEPT MATH/SALT LAKE CITY//UT/84112; RENSSELAER POLYTECH INST,DEPT MATH/TROY//NY/12181
Journal: ANNALS OF THE NEW YORK ACADEMY OF SCIENCES, 1979, V316, FEB, P 511-516
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Journal Subject Category: MULTIDISCIPLINARY SCIENCES
Cited References:
FLAHERTY JE, 1978, V58, P5, STUD APPL MATH
HOPPENSTEADT FC, 1976, V194, P335, SCIENCE
HOPPENSTEADT FC, 1977, MATH METHODS POPULAT

1/5/322 (Item 15 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

02241724 Genuine Article#: FQ871 Number of References: 36
Title: PLASMID INCOMPATIBILITY
Author(s): NOVICK RP; **HOPPENSTEADT FC**
Corporate Source: PUBL HLTH RES INST CITY NEW YORK INC,DEPT PLASMID BIOL/NEW YORK//NY/10016; UNIV UTAH,DEPT MATH/SALT LAKE CITY//UT/84112; NYU,COURANT INST MATH SCI/NEW YORK//NY/10003
Journal: PLASMID, 1978, V1, N4, P421-434
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC LIFE--Current Contents, Life Sciences
Journal Subject Category: GENETICS & HEREDITY
Cited References:
BAZARAL M, 1970, V9, P399, BIOCHEMISTRY
CABELLO F, 1976, V259, P285, NATURE
CANNINGS C, 1974, V6, P260, ADV APPL PROB
DEVRIES JK, 1975, P166, MICROBIOLOGY 1974
DUBNAU E, 1968, V95, P531, J BACTERIOLOGY
FELLER W, 1968, V1, P118, INTRO PROBABILITY TH
FIGURSKI D, 1978, P105, MICROBIOLOGY 1978
GUSTAFSSON P, 1975, V123, P443, J BACTERIOLOGY
HERSHFIELD V, 1973, V115, P1208, J BACTERIOLOGY
IORDANESCU S, 1975, V124, P597, J BACTERIOLOGY
ISHII K, 1978, V1, P435, PLASMID
JACOB F, 1963, V28, P329, COLD SPRING HARB SYM
KAHN P, 1964, V88, P1573, J BACTERIOLOGY
KIMURA M, 1958, V28, P882, ANN MATH STAT
MAAS R, 1963, V50, P1051, P NATL ACAD SCI USA
MACFARREN AC, 1967, V94, P365, J BACTERIOLOGY
MICHAELIS P, 1955, V20, P315, CYTOLOGIA
NOVICK RP, 1976, V40, P168, BACTERIOLOGICAL REV
NOVICK RP, 1967, V26, P29, FEDERATION PROC
NOVICK RP, 1965, V90, P467, J BACTERIOLOGY
NOVICK RP, 1972, V68, P285, J MOL BIOLOGY
NOVICK RP, 1975, P115, MICROBIOLOGY 1974
NOVICK RP, 1976, V262, P623, NATURE
PALCHAUDHURI S, 1978, P197, MICROBIOLOGY 1978
PEYRU G, 1969, V98, P215, J BACTERIOLOGY
PONTIER J, 1973, V22, P120, ACTA BIOTHEORET
PREER JR, 1976, V27, P227, GENETICAL RESEARCH
PRITCHARD RH, 1969, V19, P263, S SOC GEN MICROBIOL

ROWND R, 1969, V44, P387, J MOL BIOLOGY
RUBY C, 1975, V72, P5031, P NATL ACAD SCI USA
SCHENSTED IV, 1958, V92, P161, AM NATURALIST
TIMMIS K, 1974, V71, P4556, P NATL ACAD SCI USA
UHLIN BE, 1975, V124, P641, J BACTERIOLOGY
WATANABE T, 1964, V88, P716, J BACTERIOLOGY
WILLETTS NS, 1974, V118, P778, J BACTERIOLOGY
WRIGHT S, 1968, V2, EVOLUTION GENETICS P

1/5/323 (Item 16 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

02170360 Genuine Article#: FK956 Number of References: 5
Title: ITERATED AVERAGING METHODS FOR SYSTEMS OF ORDINARY DIFFERENTIAL-EQUATIONS WITH A SMALL PARAMETER
Author(s): PERSEK SC; **HOPPENSTEADT FC**
Corporate Source: MARIST COLL/POUGHKEEPSIE//NY/12601; NYU,COURANT INST MATH SCI/NEW YORK//NY/10012; UNIV UTAH/SALT LAKE CITY//UT/84112
Journal: COMMUNICATIONS ON PURE AND APPLIED MATHEMATICS, 1978, V31, N2, P 133-156
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS, APPLIED
Cited References:
BALACHANDRA M, 1975, V58, P261, ARCH RATIONAL MECHAN
BOGOLYUBOV N, 1961, ASYMPTOTIC METHODS T
HOPPENSTEADT FC, 1976, V22, P237, J DIFFERENTIAL EQUAT
PERSEK S, 1976, THESIS NEW YORK U
VAINBERG MM, 1962, V17, P1, RUSSIAN MATH SURVEYS

1/5/324 (Item 17 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

02151314 Genuine Article#: FJ467 Number of References: 10
Title: DYNAMICS OF JOSEPHSON JUNCTION
Author(s): LEVI M; **HOPPENSTEADT FC** ; MIRANKER WL
Corporate Source: NYU,COURANT INST MATH SCI/NEW YORK//NY/10012; IBM CORP,THOMAS J WATSON RES CTR/YORKTOWN HTS//NY/10598
Journal: QUARTERLY OF APPLIED MATHEMATICS, 1978, V36, N2, P167-198
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences; CC ENGI--Current Contents, Engineering, Technology & Applied Sciences
Journal Subject Category: MATHEMATICS, APPLIED
Cited References:
IMRY Y, UNPUBLISHED
IMRY Y, 1975 P STANF APPL SU
LANDBERG DN, 1966, V21, P30, SCI AM
LINIGER W, UNPUBLISHED
MATISOO J, 1969, V5, P848, IEEE T MAGN
ODEH F, UNPUBLISHED
OWEN CS, 1967, V164, P538, PHYSICAL REVIEW
ROWELL JM, 1963, V11, P200, PHYSICAL REVIEW LETT
STOKER JJ, 1950, NONLINEAR VIBRATIONS
TRICOMI F, 1933, V2, ANN SC NORM SUP PISA

1/5/325 (Item 18 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

01858972 Genuine Article#: EH593 Number of References: 16
Title: FREQUENCY ENTRAINMENT OF A FORCED VANDERPOL OSCILLATOR
Author(s): FLAHERTY JE; **HOPPENSTEADT FC**
Corporate Source: RENSSELAER POLYTECH INST/TROY//NY/12181; NYU,COURANT INST MATH SCI/NEW YORK//NY/10012
Journal: STUDIES IN APPLIED MATHEMATICS, 1978, V58, N1, P5-15
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS, APPLIED
Cited References:

CARTWRIGHT ML, 1947, V48, P472, ANN MATH
CARTWRIGHT ML, 1951, V54, P1, ANN MATH
CARTWRIGHT ML, 1949, V45, P495, CAMB PHIL SOC P
CARTWRIGHT ML, 1945, V20, P180, J LONDON MATH SOC
CARTWRIGHT ML, 1950, V1, 20 ANN MATH SER
COLE JD, 1968, PERTURBATION METHODS
GRASMAN J, 1976, V31, P667, SIAM J APPL MATH
HAYASHI C, 1964, NONLINEAR OSCILLATIO
HENON M, 1976, V50, P69, COMMUN MATH PHYS
HINDMARSH AC, 1974, UCID30001 LAWR LIV L
KRYLOV N, 1947, 11 ANN MATH SER
LEVINSON N, 1949, V50, P127, ANN MATH
LITTLEWOOD JE, 1957, V97, P267, ACTA MATH
MOSER JK, 1973, ANN MATH STUD
STOKER JJ, 1950, NONLINEAR VIBRATIONS
WASOW W, 1965, ASYMPTOTIC EXPANSION

1/5/326 (Item 19 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

01668285 Genuine Article#: DT674 Number of References: 19
Title: SLOWLY MODULATED OSCILLATIONS IN NONLINEAR DIFFUSION PROCESSES
Author(s): COHEN DS; **HOPPENSTEADT FC** ; MIURA RM
Corporate Source: CALTECH,DEPT APPL MATH/PASADENA//CA/91125; NYU,COURANT INST MATH SCI/NEW YORK//NY/10012; UNIV BRITISH COLUMBIA,DEPT MATH/VANCOUVER V6T 1W5/BRITISH COLUMBI/CANADA/
Journal: SIAM JOURNAL ON APPLIED MATHEMATICS, 1977, V33, N2, P217-229
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA; CANADA
Subfile: SciSearch
Journal Subject Category: MATHEMATICS, APPLIED
Cited References:

AMUNDSON NR, 1974, V8, P59, MATHEMATICAL ASPECTS
ARIS R, 1975, V2, MATHEMATICAL THEORY
COHEN DS, 1975, V25, P307, SIAM J A MA
COHEN DS, 1973, V25, P640, SIAM J APPL MATH
COHEN DS, TO BE PUBLISHED
DUBOIS DM, 1975, V1, P67, ECOL MODEL
EIGENBERGER G, 1972, V27, P1917, CHEM ENG SCI
ERVIN MA, 1972, V27, P339, CHEM ENG SC
HALLAM TG, TO BE PUBLISHED
HESS B, 1971, V40, P237, ANNU REV BIOCHEM
HOPPENSTEADT FC, 1975, MATHEMATICAL THEORIE
KEENER JP, 1975, V56, P354, NUCL SCI EN
LUSS D, 1972, V27, P315, CHEM ENG SC
MIURA RM, 1974, V26, P376, SIAM J A MA
NEWELL AC, 1969, V38, P279, J FLUID MECH
NEWELL AC, 1974, V15, P157, NONLINEAR WAVE MOTIO
SEGEL LA, 1969, V38, P203, J FLUID MECH
STEVEN DM, 1972, V237, P105, NATURE
WHITHAM GB, 1965, V283, P238, P ROY SOC A

1/5/327 (Item 20 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

01586592 Genuine Article#: DL998 Number of References: 5
Title: MULTI-TIME METHODS FOR SYSTEMS OF DIFFERENCE EQUATIONS
Author(s): **HOPPENSTEADT FC** ; MIRANKER WL
Corporate Source: NYU,COURANT INST MATH SCI/NEW YORK//NY/10012; IBM CORP,THOMAS J WATSON RES CTR/YORKTOWN HTS//NY/10598
Journal: STUDIES IN APPLIED MATHEMATICS, 1977, V56, N3, P273-289
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS, APPLIED
Cited References:
CROW JF, 1970, INTRO POPULATION GEN
GREENBERG HJ, 1964, V8, P299, IBM J RES DEV
HOPPENSTEADT FC, 1976, V22, P237, J DIFFERENTIAL EQUAT
MIRANKER WL, 1973, V10, P416, LECTURE NOTES COMPUT
PERSEK SC, 1976, THESIS NYU

1/5/328 (Item 21 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

01367359 Genuine Article#: CU987 Number of References: 11
Title: PERIODIC-SOLUTIONS OF A LOGISTIC DIFFERENCE EQUATION
Author(s): **HOPPENSTEADT FC** ; HYMAN JM
Corporate Source: NYU,COURANT INST MATH SCI/NEW YORK//NY/10012
Journal: SIAM JOURNAL ON APPLIED MATHEMATICS, 1977, V32, N1, P73-81
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch
Journal Subject Category: MATHEMATICS, APPLIED
Cited References:
BROLIN H, 1965, V6, P103, ARK MAT
GREENBERG JM, 1975, V28, P662, SIAM J A MA
HENRY BR, 1973, V41, P146, P AM MATHEMATICAL SO
HOPPENSTEADT F, 1975, MATHEMATICAL THEORIE
LI TY, 1975, AM MATH MONTHLY
LORENZ EN, 1964, V16, P1, TELLUS
MAY RM, TO BE PUBLISHED
METROPOLIS N, 1973, V15, P25, J COMBINATORIAL THEO
MYRBERG PJ, 1959, V268, P1, ANN ACAD SCI FENN A
MYRBERG PJ, 1963, V366, P1, ANN ACAD SCI FENN A
ULAM S, COLLECTION MATHEMATI

1/5/329 (Item 22 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

01301257 Genuine Article#: CQ100 Number of References: 4
Title: DIFFERENTIAL-EQUATIONS HAVING RAPIDLY CHANGING SOLUTIONS - ANALYTIC METHODS FOR WEAKLY NONLINEAR-SYSTEMS
Author(s): **HOPPENSTEADT FC** ; MIRANKER WL
Corporate Source: NYU,COURANT INST MATH SCI/NEW YORK//NY/10012; IBM CORP,THOMAS J WATSON RES CTR,DEPT MATH/YORKTOWN HTS//NY/10598
Journal: JOURNAL OF DIFFERENTIAL EQUATIONS, 1976, V22, N2, P237-249
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS

Cited References:
HOPPENSTEADT F, 1971, V24, P807, COMM PURE APPL MATH
MIRANKER WL, 1974, V1, P416, COMPUTING METHODS AP
MIRANKER WL, 1974, RC4792 IBM RES TECHN
VOLOSOV VM, 1962, V17, P1, RUSSIAN MATH SURVEYS

1/5/330 (Item 23 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

01197111 Genuine Article#: CF539 Number of References: 7
Title: SYNCHRONIZATION OF PERIODICAL CICADA EMERGENCIES
Author(s): **HOPPENSTEADT FC** ; KELLER JB
Corporate Source: NYU,COURANT INST MATH SCI/NEW YORK//NY/10012; NYU,COURANT INST MATH SCI/NEW YORK//NY/10012
Journal: SCIENCE, 1976, V194, N4262, P335-337
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC AGRI--Current Contents, Agriculture, Biology & Environmental Sciences
Journal Subject Category: MULTIDISCIPLINARY SCIENCES
Cited References:
ALEXANDER RD, 1962, 121 U MICH MUS ZOOL
HOLLING CS, 1973, V4, P1, ANNUAL REV ECOLOGY S
LARKIN PA, 1964, V21, P477, J FISH RES BD CAN
LESLIE PH, 1945, V33, P183, BIOMETRIKA
LLOYD M, 1966, V20, P133, EVOLUTION
LLOYD M, 1966, V20, P466, EVOLUTION
WHITE JA, 1975, V94, P127, AM MIDL NAT

1/5/331 (Item 24 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

01002260 Genuine Article#: BN708 Number of References: 13
Title: SLOW SELECTION ANALYSIS OF 2 LOCUS, 2 ALLELE TRAITS
Author(s): **HOPPENSTEADT FC**
Corporate Source: NYU COURANT INST MATH SCI/NEW YORK//NY/10012
Journal: THEORETICAL POPULATION BIOLOGY, 1976, V9, N1, P68-81
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC LIFE--Current Contents, Life Sciences
Journal Subject Category: GENETICS & HEREDITY
Cited References:
CHARLESWORTH B, 1970, V1, P352, THEORETICAL POPULATI
CROW JF, 1970, INTRO POPULATION GEN
FELDMAN MW, 1970, V1, P371, THEORET POP BIOL
FELSENSTEIN J, 1965, V52, P349, GENETICS
FISHER RA, 1930, GENETICAL THEORY NAT
HADELER KP, 1974, V1, P51, J MATH BIOL
HOPPENSTEADT F, 1971, V24, P807, COMM PURE APPL MATH
HOPPENSTEADT F, 1975, MATHEMATICAL THEORIE
KARLIN S, 1972, V3, P186, THEORET POP BIOL
KIMURA M, 1965, V52, P875, GENETICS
NAGYLAKI T, 1974, V71, P526, P NAT ACAD SCI US
NAGYLAKI T, 1974, V5, P257, THEOR POP BIOL
WRIGHT S, 1969, V2, EVOLUTION GENETICS P

1/5/332 (Item 25 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

00807137 Genuine Article#: AV393 Number of References: 3
Title: ANALYSIS OF A STABLE POLYMORPHISM ARISING IN A SELECTION-MIGRATION

MODEL IN POPULATION GENETICS
Author(s): **HOPPENSTEADT FC**
Corporate Source: NYU,COURANT INST MATH SCI/NEW YORK//NY/10012
Journal: JOURNAL OF MATHEMATICAL BIOLOGY, 1975, V2, N3, P235-240
Language: ENGLISH   Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC LIFE--Current Contents, Life Sciences
Journal Subject Category: BIOLOGY, MISCELLANEOUS; MATHEMATICS, MISCELLANEOUS
Cited References:
FISHER RA, 1950, V6, P353, BIOMETRICS
FLEMING WH, 1975, V2, P219, J MATH BIOL
HOPPENSTEADT FC, 1975, V28, COMM PURE APPL MATH

1/5/333 (Item 26 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

00791123 Genuine Article#: AU137 Number of References: 14
Title: NONLINEAR STABILITY ANALYSIS OF STATIC STATES WHICH ARISE THROUGH BIFURCATION
Author(s): **HOPPENSTEADT F** ; GORDON N
Corporate Source: CITY COLL NEW YORK/NEW YORK//NY/00000; NYU,COURANT INST MATH SCI/NEW YORK//NY/10003
Journal: COMMUNICATIONS ON PURE AND APPLIED MATHEMATICS, 1975, V28, N3, P 355-373
Language: ENGLISH   Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS, APPLIED
Cited References:
ECKHAUS W, 1969, INSTABILITY CONTINUO
GORDON N, 1973, THESIS NEW YORK U
GRAVES LM, 1955, V79, P150, T AM MATH SOC
HABETLER GJ, IN PRESS
HOPPENSTEADT F, 1969, V35, P284, ARCH RATIONAL MECH A
HOPPENSTEADT F, 1971, V24, P17, COMM PURE APPL MATH
HOPPENSTEADT F, 1974, V15, P510, DIFF EQNS
HOPPENSTEADT F, 1975, V17, P123, SIAM REV
HOPPENSTEADT FC, 1971, V24, P807, COMMUN PURE APPL MAT
IUDOVICH VI, 1967, V31, P103, PRIKL MAT MEKH
KELLER JB, 1971, V20, P619, SIAM J APPL MATH
SOBOLEVSKII PE, 1966, V49, P1, AM MATH SOC TRANSL
STUART JT, 1960, V9, P352, J FLUID MECH
TRENOGIN V, 1964, V4, P1261, SOVIET MATH

1/5/334 (Item 27 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

00591779 Genuine Article#: AA195 Number of References: 3
Title: ASYMPTOTIC-BEHAVIOR OF SOLUTIONS TO A POPULATION EQUATION
Author(s): GREENBERG JM; **HOPPENSTEADT F**
Corporate Source: STATE UNIV NEW YORK/AMHERST//NY/14226; NYU,COURANT INST MATH SCI/NEW YORK//NY/10012
Journal: SIAM JOURNAL ON APPLIED MATHEMATICS, 1975, V28, N3, P662-674
Language: ENGLISH   Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS, APPLIED
Cited References:
COOKE KL, 1973, V16, P75, MATH BIOSCI
HOPF E, 1950, V3, P201, COMM PURE APPL MATH

HOPPENSTEADT F, 1971, V12, P133, MATH BIOSCI

1/5/335 (Item 28 from file: 434)
DIALOG(R)File 434:SciSearch(R) Cited Ref Sci

00547062 Genuine Article#: V9713 Number of References: 35
Title: ANALYSIS OF SOME PROBLEMS HAVING MATCHED ASYMPTOTIC EXPANSION SOLUTIONS
Author(s): **HOPPENSTEADT F**
Corporate Source: NYU,COURANT INST MATH SCI/NEW YORK//NY/10012
Journal: SIAM REVIEW, 1975, V17, N1, P123-135
Language: ENGLISH Document Type: ARTICLE
Geographic Location: USA
Subfile: SciSearch; CC PHYS--Current Contents, Physical, Chemical & Earth Sciences
Journal Subject Category: MATHEMATICS, APPLIED
Cited References:
AGMON S, 1962, V15, P119, COMMUN PURE APPL MAT
CHOW PL, 1972, V22, P629, SIAM J APPL MATH
COLE J, 1968, PERTURBATION METHODS
ECKHAUS W, TO BE PUBLISHED
FIFE P, 1972, V1, P331, APPLICABLE ANALYSIS
FRAENKEL LE, 1969, V65, P209, P CAMBRIDGE PHILOS S
FRIEDMAN A, 1968, V29, P289, ARCH RATIONAL MECH A
GORDON N, 1973, THESIS NEW YORK U
GORDON N, TO BE PUBLISHED
HOPF E, 1948, V1, P303, COMM PURE APPL MATH
HOPF E, 1955, P C DIFFERENTIAL EQU
HOPPENSTEADT E, 1969, V25, P521, J MATH ANALYSIS APPL
HOPPENSTEADT F, 1969, V35, P284, ARCH RATIONAL MECH A
HOPPENSTEADT F, 1970, V76, P142, B AM MATH SOC
HOPPENSTEADT F, 1971, V24, P17, COMM PURE APPL MATH
HOPPENSTEADT F, TO BE PUBLISHED
HOPPENSTEADT FC, 1971, V24, P807, COMMUN PURE APPL MAT
JOSEPH DD, 1972, V45, P79, ARCH RAT MECH ANAL
JUDOVICH VI, 1967, V31, P101, J APPL MATH MECH
KELLER JB, 1972, NONLINEAR STABILITY
KELLER JB, 1970, V18, P748, SIAM J APPL MATH
KOGELMAN S, 1971, V20, P619, SIAM J APPL MATH
KOGELMAN S, 1973, V24, P352, SIAM J APPL MATH
LADYZHENSKAYA OA, 1969, MATHEMATICAL THEORY
LANDAU LD, 1959, FLUID MECHANICS
LUKE JC, 1966, V292, P403, P ROY SOC A
MATKOWSKY BJ, 1970, V76, P620, B AM MATH SOC
MATKOWSKY BJ, 1970, V18, P872, SIAM J APPL MATH
REISS EL, 1971, V13, P189, SIAM REVIEW
SATTINGER DH, 1971, V43, P154, ARCH RAT MECH ANAL
SOBOLEVSKII PE, 1966, V49, P1, AM MATH SOC TRANSL
VAINBERG MM, 1962, V17, P1, RUSSIAN MATH SURVEYS
VANDYKE M, 1964, PERTURBATION METHODS
VOLOSOV VM, 1962, V17, P1, RUSSIAN MATH SURVEYS
YOSIDA K, 1958, V34, P337, JAPAN ACAD P